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EXPLORATIONS ON THE BURMA-TIBET FRONTIER: *A paper read at the Evening Meeting of the Society on 25 April 1932, by*

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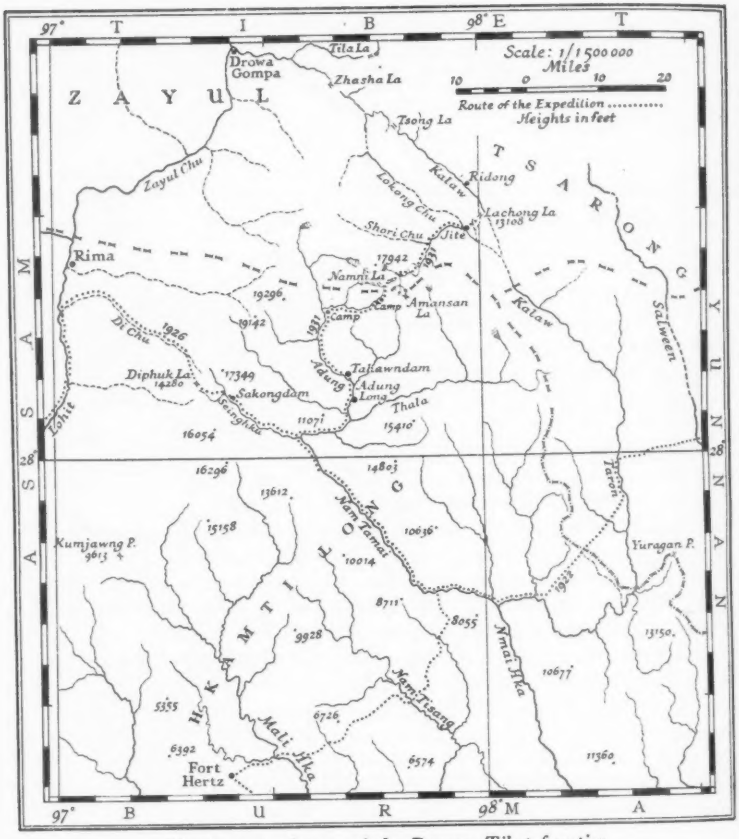
IN 1930 Lord Cranbrook and I arranged to make an expedition to the sources of the Irrawaddy. Our objects were: (i) to collect specimens of the fauna and flora, and to introduce into Britain new hardy plants from that area; (ii) to cross the pass at the head of the Nam Tamai valley directly into Tibet, and link up our route, if possible, with that of any other traveller farther north; (iii) to make observations on the glaciers of this region, as to whether they were retreating or advancing, and how far they had formerly extended. I had previously undertaken several journeys at the headwaters of the Irrawaddy, but much remained to be done, especially farther north than I had hitherto penetrated. As in 1926 and 1928 the Trustees of the Percy Sladen Memorial Fund gave a grant towards the expenses of the expedition.

We arrived at Rangoon in November 1930, and proceeded by train to Myitkyina. The expedition finally left Myitkyina on November 26, reaching Fort Hertz on December 16. Here we were held up for several days. We left Fort Hertz on the 27th, and from that date onwards collecting work began in earnest. There is a cold-weather mule path from Fort Hertz to the Tamai river, eight marches in a north-easterly direction, and, when the Tamai bridges are in repair, for six marches up the Tamai, as far as the Seinghku confluence; but owing to the intransigeant attitude of the Yunnan government, Chinese mules working in Burma are not allowed to travel east of the Mali Hka, so after leaving Fort Hertz we had to rely on coolies for transport.

Between the Mali Hka and the Tamai, the mountains reach a height of 6000–8000 feet, and are densely covered with a type of evergreen forest which may be called hill-jungle. This forest extends eastwards from the foothills of Nepal and Sikkim, across Assam and Upper Burma, into Yunnan, in a continuous belt. It is possible now to lay down its limits with some degree of accuracy, and it is surprising how many tree species extend right across, linking up the Himalayan flora with the Chinese flora. On this journey I was able to extend the known distribution of many Himalayan trees eastwards, as well as of several Chinese species westwards, establishing beyond question the continuity of the forest flora in an east-west direction.

We reached the Tamai river a few miles above its confluence with the Taron on January 7. Progress was slow, on account of the shortage of transport, and we did not reach the Seinghku confluence till the 25th. At this point the Seinghku, from the north-west, joins the Adung (as the upper Tamai is called) which flows in from due east, and the combined river swings abruptly through



Sketch-map of part of the Burma–Tibet frontier

135° to flow south-east as the Tamai, continuing the direction of the smaller affluent.

Hitherto we had been on a proper path, even a mule path in the dry weather, but from the Seinghku–Adung confluence there is only a native track up either valley. I had been up the Seinghku valley in 1926; I now proposed to follow the Adung valley to its source, and ascertain whether or no there was a practicable pass into Tibet at its head. In 1926 I had crossed the Diphuk La, at the head of the Seinghku valley, and descended direct to the Lohit river, just

below Rima; this pass therefore straddles the Irrawaddy–Brahmaputra divide. But a pass at the head of the Adung valley, though it would lead directly into Tibet, would not cross the Irrawaddy–Brahmaputra divide. The general direction up this valley being north-east, or north-north-east, it must lead directly into the upper Taron valley, the main source of the Irrawaddy. Therefore, in order to reach the Lohit, it would be necessary either to bear more to the west, or to cross two passes.

The first European to see the Adung valley was the late Captain B. E. A. Pritchard, who in January 1913 ascended about 12 miles to the village of Adung Long, or Lama Ne. He was drowned in the Taron a few months later, during the course of the same journey. A few years later, Mr. P.M. R. Leonard, of the Burma Frontier Service, ascended to the last village, called Tahawndam, and continued a few miles beyond that. So far as I know, they are the only two who preceded us; at any rate no subsequent officer had been beyond the point reached by Mr. Leonard. Native surveyors of the Survey of India had however been up to, or nearly up to, the head of the valley in 1920–22, so that we had a good map of our proposed route. Unfortunately maps show neither political nor climatic obstacles, and having met with no difficulties as far as Tahawndam, the last village in Burma, we became rather too sanguine as regards the rest of the journey. We started up the Adung valley on February 2. At the confluence the river bed stands at 4000 feet above sea, and the mountains on either side, though very precipitous, are thickly forested. The end of the spur in the wide angle between the two rivers however is truncated in a series of escarpments, on which grow scattered trees of *Pinus excelsa*, a Conifer which, from this point onwards, is never far away. At the base of this great cliff, and at an altitude of only 4000 feet, a Tibetan family has settled, the advance guard of a movement southwards down the Irrawaddy ridges. This Tibetan migration wave is moving athwart a westward moving wave of Lisus from the Salween valley; and both are impinging not only against a solid block of Kachin tribes who already occupy the best sites, but also against a definite northward movement from the plains of Upper Burma towards the hill tracts. It will be interesting to see which prevails.

The first day's march lay up the left bank of the Adung, mostly in thick forest, never high above the river, and occasionally in the river bed. Easy as the path was, we made barely 5 miles (measured off the map) in seven hours; nor did we see any huts, though we met a party of Darus. Though we saw no huts—which are widely scattered and well concealed higher up the slopes—there were not lacking, in the rope and suspension bridges, and even in the trail we followed, signs of the presence of man; in the evening we came out on to a cultivated slope. On the following day we had a shorter and more interesting march. It was both more difficult, where we had to climb the cliffs, and cross a precipitous rock face, and at the same time easier, where down below we crossed several cultivated terraces; but as usual the jungle huts were not on the path. We had now changed our direction, and from marching eastwards were again marching northwards towards our goal. On February 4 we had an easy march up and down the cliffs to Adung Long, situated in a wider part of the valley, where the vegetation begins to change

from predominantly hill jungle of Indo-Malayan type to warm temperate, with a considerable admixture of deciduous trees.

From Adung Long to the Seinghku confluence, the river falls about 1000 feet in 13 miles. We had left behind us three big tributaries, two from the east and one from the west; but as these rise amongst the high snow-covered hills of the interior fastness, at this season they bring down very little water, and the Adung river had not shrunk greatly at Adung Long. The steepest gradients in the river bed occurred just below each confluence, which suggests that the river is comparatively young. Indeed, the course of the Adung, as of so many rivers in this region, is altogether odd. The Seinghku appears to have been originally the upper course of the Tamai, no doubt when all the country north of Adung Long was under glacier ice, and very little water was flowing down the Adung valley. At any rate it is significant that the Adung valley, at least as far south as 28° 3′, appears to have been glaciated; the lack of overlap in the spurs—almost, one might say, the absence of spurs—the rounded summits of the hills, the extraordinary levelness of the ridges, no less than the wide profile of the valley and the straight sides of the escarpment often set well back from the present gorge, all point to glacier action. But naturally forest growth has obscured much of the detail, nor has the climate helped to preserve the harsh outline of a thoroughly glaciated region. It was only when we got farther up the valley, and indeed found living glaciers, that the last doubt vanished. The rock is everywhere of igneous origin, mainly granite; and this formed characteristic slab-faced outcrops and escarpments, bare of trees, on all south-facing slopes. At Adung Long there are whole broad slopes clothed with grass and bracken, dotted with widely scattered trees; but these pastures owe their treelessness largely, if not entirely, to fire.

On February 5 a short march by an easy path, ascending however nearly 1000 feet, brought us to Tahawndam, the last village in Burma, on the left bank of the Adung river. About halfway we passed the junction of the last big tributary of the Adung, both below and above which are furious rapids. Here the valley, which lies north-west to south-east, widens out again, before finally contracting to a deep and narrow gorge a few miles farther upstream. By this time the forest is definitely warm temperate, and the Himalayan Pine (*P. excelsa*), together with oaks, maples, rhododendrons, and *Michelia doltsopa* grow along the river bank at the bottom of the gorge.

Tahawndam is the spearhead of the Tibetan irruption into the Irrawaddy basin. The political status of these headwater valleys has long been a subject of controversy, not only between the Indian, Chinese, and Tibetan governments, but between different schools of thought in India. British official opinion appears to be strangely inclined towards geographical frontiers, especially watersheds, irrespective of the implications. At the sources of the Irrawaddy such a frontier is impossible, as well as undesirable. It would imply administering territory on the far side of a great snowy range, inaccessible during six months of the year; territory which has moreover long been administered by Tibet, or at any rate by Tibetans.

For this reason the Taron valley was definitely and finally excluded from the North-East Frontier of Burma and Tibet's (or China's) claim to it recognized. As the frontier had now to cross the gorge of the Taron somewhere,

Looking north up the Nam Tamai towards the Tibetan frontier range

A Daru harpooning fish in the Tamai

A Nung fishing with casting net in the Tisang

A Daru harpooning fish in the Tamai

A Nung fishing with casting net in the Tisang

efforts were made to find a suitable line; and one was found based on Pritchard's report on his explorations on the upper Taron, in the course of his last fatal journey.

The second great headwater stream of the eastern Irrawaddy is the Tamai, which, as we have seen, splits into the Seinghku and the Adung; and here government has spoken with two voices. At one time it was proposed to claim only the Seinghku valley, which gave to Burma the Diphuk La, a pass giving direct access over the Irrawaddy–Lohit divide into Assam; the Adung valley was to be presented to Tibet, and is completely excluded from the administered area on Sheet 91 H of the Survey of India, on which no Burma–Tibet international boundary, demarcated or undemarcated, is shown. In 1930 however it was decided to retain the Adung valley as well, although owing to its remoteness its administration presents certain difficulties. The new policy is clearly dictated by the desire to make the watershed the frontier; hence the misgivings and complications when the Tibetans cross the passes and settle on the Burmese side of the frontier.

But obviously a pass of 15,000 feet is nothing to a Tibetan, who habitually lives at 10,000 or 12,000 feet altitude. The Tibetan is not stopped by physical, but by climatic barriers; and no boundary pillars are needed to make him respect these. His frontier is the verge of the grassland, the fringe of the Pine forest, the 50-inch rainfall contour beyond which no salt is[1] (until indeed you come to the sea), or the 75 per cent. saturated atmosphere. The barrier may be invisible; but it is a far more formidable one to a Tibetan than the Great Himalayan range. If he crosses it, he must revolutionize his mode of life. It is just here that the maps of mountainous frontier regions are apt to convey a false impression. These invisible barriers, so thoroughly respected by simpler civilizations than our own, cannot be depicted on an ordinary map, which unconsciously fixes our attention on mighty ramparts of rock.

Tahawndam itself comprises three Tibetan families, whose wooden single-roomed cabins, thatched with grass, stand amidst permanent cultivation in the valley bottom, at an altitude of 6000 feet. These people possess herds of half-bred yak, and goats, which furnish them with milk and butter; sheep, pigs, fowls, and two breeds of dog, the ordinary Tibetan mastiff watch-dog (smaller than those commonly met with in Tibet), and a small smooth-coated prick-eared yellow dog used for hunting. Yak are yoked to the plough. The Tibetans also hunt gooral, serow, and barking deer, and collect wild honey. They cultivate barley, oats, maize, buckwheat, millet, peas, and beans. In fact they live extremely well. Not so the Darus, of whom there are five or six families scattered up the slopes of the valley, where they grow crops on the old river terraces, sometimes nearly 1000 feet above the river. They have no cattle, and subsist precariously on their scanty crops, and on jungle produce. Such meat as they get comprises chiefly small animals—squirrels, flying squirrels, and bandicoots, though they also hunt larger game and snare pheasants. Temminck's tragopan occurs here above 8000 feet, and higher up the valley Geoffroy's blood-pheasant and the crestless monaul (*Lophophorus sclateri*).

One is tempted to think that the Tibetans are gradually ousting the Darus

[1] See 'Diet and Race,' by F. P. Armitage, *Longmans, Green & Co.* 1922.

from these valleys, but this seems unlikely. The Darus may indeed give way before the Tibetan pressure, but the Tibetan will not willingly exterminate the Daru; he finds him much too useful, and might be hard put to it to survive in these sour jungles if he had not the Daru to work for him.

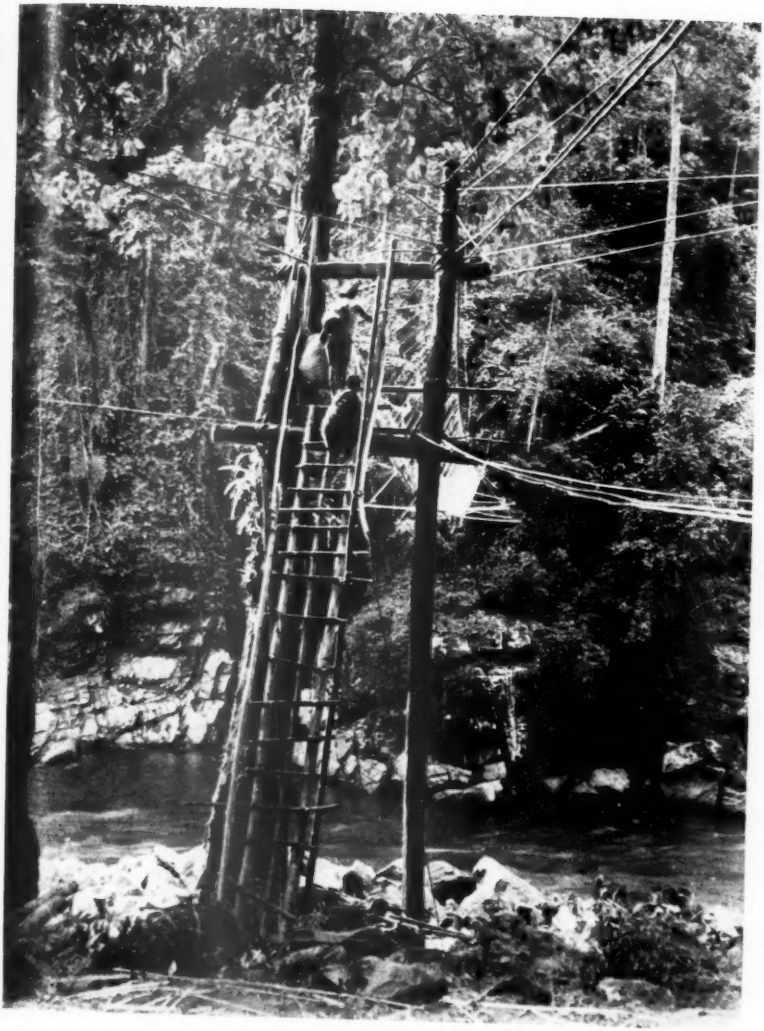
The Daru appear to be the only tribe of the upper Irrawaddy who have no generic name for themselves. The Tibetans call them Dalu or Talu. The English must have added the *r* sound. It is significant that the Mishmi, who live in the Lohit valley to the west, call the Lohit river the Tellu, which is obviously the same word. There is no evidence that the Daru have been pushed up towards the sources of the Irrawaddy from the south, nor is there any argument for such a theory. It seems to me much more probable that they came originally from the north and west, being forced over into the Irrawaddy by Tibetan pressure consequent upon Chinese pressure from the east. In other words, Mishmi and Daru are probably derived from a common ancestry in Zayul province; the Mishmi following the Lohit valley towards Assam, the Daru crossing the great range and lurking in the valleys of the upper Irrawaddy. They were prevented from moving farther south by the Kachins and the Shans, marching and counter-marching across the hill country south of Hkamti Long. Bailey, when he was at Rima, notes that the country over the range to the east of Rima, called Cho—in other words, the valley of the Tamai and its headwaters—is inhabited by a race similar to the Mishmi.[1]

The Daru are the same as the people called Khanung by the Shans of Hkamti Long; the Khanung, or Nung, is simply a more cultivated Daru. The people of the Taron valley, to the east of the Tamai, called Talong or Dalong by the Tibetans, are of the same stock, and speak practically the same language; Talong being obviously the same word as Taron. The Daru, though wild-looking, are very timid folk. They are usually dwarf, not exceeding 5 feet in height, though exceptions are sufficiently common to require explanation; women are shorter than men. Girls often tattoo their faces with blue lines and circles, or crosses; there are several patterns in vogue, and as these are segregated in different localities they presumably indicate clans; but tattooing seems to be optional, and of no real significance other than ornamental.

Other peculiarities of the Khanung or Daru are their use of the "necktie" hoe (a short iron implement with a wooden handle, used for scraping weeds), their method of harpooning fish—the harpoon, with four detachable iron hooks fixed loosely into sockets at the end of a bamboo is perhaps more in the nature of a grapple than a harpoon—and their use of thorn-lined bamboo fish traps.

They burn their dead, the ashes often lying in state (in the open) for a considerable time awaiting a favourable, which means a financially favourable, opportunity for interment. It is the burying, not the burning, which is the significant ceremony. A wooden coffin, shaped, and sometimes rudely carved with a face, like an Egyptian sarcophagus, contains the ashes; and during the lying in state the material property of the deceased, together with a few takin or other horns, decorate the bamboo platform. The religion of all these tribes is a primitive animism, nor has contact with the Tibetans substituted even

[1] "Journey through a Portion of South-Eastern Tibet and the Mishmi Hills," by Captain F. M. Bailey, *Geogr. J.*, April 1912.



Supports of a cane bridge spanning the Nam Tamai

Tattooed Daru girl

A Tibetan of Tahawondam, Adung valley

Tattooed Daru girl

A Tibetan of Tahawondam, Adung valley

the most debauched Buddhist ideas for simple nature-placation; rather have the Tibetans who cross the range become infected with animism. The reason is clear. No Tibetan Buddhist monk considers it financially worth while to spread the gospel in such a country, amongst such a people.

We made Tahawndam our base for the year, and spent the next three months here. To our chagrin we found that the Tibetans do not take their herds up the valley to the foot of the pass, as we expected, in the summer; they take them straight up the mountain side above the village. This made things more difficult for us. Our object was to cross the pass at the head of the Adung valley, but we discovered that the pass is more used by the people on the other side than by the local inhabitants. As the pass was six days' march from the village, and the first village on the far side was another two days' march, everything turned on the transport problem. In the middle of May we moved our camp three days' march up the valley to a point where the river bifurcates. The actual distance was no more than about 15 miles, but the going was hard for the coolies. Lightly laden coolies would do it in two days. The track follows the left bank of the river, through the forest, and for the last few miles is high above the stream, descending again at the point of bifurcation. We camped on the left bank of the eastern branch, here bridged by an enormous tree trunk (often impassable during the rains), at an altitude of 8000 feet. The forest here is temperate mixed forest, about 50 per cent. of the trees being Conifers. These latter, especially *Picea Morinda*, *Pinus excelsa*, and *Tsuga yunnanensis*, attain a great size. Birch, maples, oaks, hollies, and, of course, rhododendrons, comprise the bulk of the broad-leafed trees and shrubs. The rhododendrons, of which there were fifteen or twenty species hereabouts, were in full bloom, and coloured the cliffs. Several species grew socially, and it was these especially which produced such gorgeous colour effects.

The north branch of the Adung rises amongst a group of snow peaks over 19,000 feet high on the main (Irrawaddy-Lohit) divide. It is certainly as big as, probably bigger than, the east branch. The water at this season was milky white, in strong contrast to the clean snow water of the eastern branch, and the gradient of the valley, for the first few miles at any rate, is distinctly less than that of the latter. Unfortunately there is only a hunters' trail up the north branch, and this soon disappeared, though not before I had reached a snow bridge across to the right bank, at a height of less than 9000 feet. A steep snow-filled gulley had thrown the snow across the river, and the bridge lasted into June, though it was wearing very thin when I last crossed it. There is said to be no pass at the head of this valley, which in itself suggests that this is the main branch, since it is unusual to find the pass at the head of the main valley; the northern branch also appears to be slightly longer than the eastern. On May 21 two Tibetans crossed the Namni La, the pass at the head of the eastern branch, for the first time that year. The winter of 1930–31 was a season of unusually heavy snowfall; and nothing could show more clearly the approach to drier Tibetan conditions than the fact of a pass over 15,000 feet high being open so early in the year. The passes to the south and east, 12,000–13,000 feet high, are rarely open before the end of June. In 1926 the Diphuk La, 14,300 feet, was not crossed till June 13. Farther north where the

climate, though severe, is much drier, the highest passes are open all the year round.

On June 6–7 we moved our camp another two marches up the valley, ascending 4000 feet in 10 miles. There was a large open boggy meadow or marsh here, surrounded by a fringe of Silver Fir (*Abies delavayi*), and bush Rhododendron; a short mile up the valley, and at 13,000 feet, more or less, on the sheltered cliff face, tree growth ceased. One may say that the tree line in the Adung valley lies between 12,000 and 13,000 feet, but that woody growth ascends another 1500 or 2000 feet. There is no plant growth above 16,000 feet. The snow-line is about 16,000–17,000 feet. We spent nearly three months in this camp before crossing the Namni La on September 1; thus we had plenty of time to explore the neighbouring valleys, as well as the main valley to its head. This marshy meadow is called Lung Sa—presumably "the valley (open) place or space"—which well describes it.

Perhaps the most surprising thing about the wild mountains we now found ourselves amongst was that there appeared to be no trace of any mammal larger than a cat-bear (*Aelurus fulgens*). Cranbrook hunted every valley assiduously, day after day, but saw nothing; neither did I on my many excursions after plants. At the top of the Seinghku valley I had frequently seen gooral up to 15,000 feet; here we saw none. A few weasels, and numerous Pika-hares in the open, and voles in the forest, represented the mammalian fauna. Blood-pheasants were numerous in one spot only, where there was a dense growth of Arundinaria. Temminck's tragopan was usually present in one high valley, and there was abundant small bird life. There were toads in the ponds, but we saw no snakes as high up as this. The alpine flora was of the usual Sino-Himalayan type, rich in species of Primula, Rhododendron, Pedicularis, Saxifraga, Gentiana, and other genera. There are also vast numbers of a species of Nomocharis (*N. Souliei*), and of *Omphalogramma Souliei*, and of two Gaultherias; while two families, Compositae and Ranunculaceae, together account for an appreciable percentage of the total alpine herbaceous flora.

The lateral valleys are all of the hanging type, and recently contained glaciers. We discovered two glaciers, as opposed to mere snow-beds, one at the extreme top of the valley, coming from a peak marked as 17,942 feet high on the survey sheet, the other in a valley to the south-east of our camp. The snow did not finally disappear from the highest ghylls till October. Thus the eastern branch of the Adung river, like the northern, may be said to rise in a glacier, and the Adung river derives some of its water, though not the bulk, from glaciers. One must however try to picture the whole of this region between the parallels of 28° and 30° N. and the meridians 92°–100° E. as covered at no very remote date, not so much with numbers of great glaciers, as with an almost continuous ice-sheet. In the neighbourhood of the Adung valley the uniform heights of the peaks and the long level ridges point conclusively to a plateau structure. This was clearly visible from our November camp immediately above the village of Tahawndam. Looking across the valley one saw the peaks on the other side sticking up from a uniform level of about 15,000–16,000 feet, which is the height of the highest glacier valleys. The heights of the peaks, which, as already observed, are remarkably uniform, give

the height of the ancient plateau. Out of this plateau a number of glaciers subsequently scooped wide comparatively shallow valleys, to a depth shown by the lips of the hanging valleys, say 13,000–14,000 feet. Lastly, as the glaciers shrank farther and farther, water cut deep V-shaped grooves in the wider ice-worn valleys.

When the ice was at its maximum, this Sino-Himalayan ice-sheet must have covered between 30,000 and 50,000 square miles; and the almost total disappearance of this vast quantity of ice, in the course of many thousands of years, has of course had a great influence on the flora, as well as on the shape of the country and on the climate.[1] In the alpine region it was noticeable how the hanging valleys occurred in tiers. Thus the side valleys overhung the main valley for 500–1000 feet. A tertiary valley overhung the side valley, also for 300–500 feet, and often a still higher valley overhung the tertiary valley. These steps probably mark a series of pauses in the retreat of the ice.

The core of the range is composed of granite, flanked on both sides by gneiss, schists, and slates, which dip steeply (45°–70°) more or less north-north-east on the southern flank of the dividing range, that is to say in the upper Adung valley, and more or less south on the northern flank, that is within the Taron basin. Thus the general strike of the rocks is east and west. Farther west a belt of crystalline limestone cuts right across the country in a general north-westerly direction parallel to the Tamai valley, where it forms the watershed between the Tamai and the Mali Hka[2]; but we diverged from this, and nowhere did we meet with limestone. If this belt continues in the same direction, it should reach the Lohit valley just north of Rima, and presumably the Lohit river cuts across it.

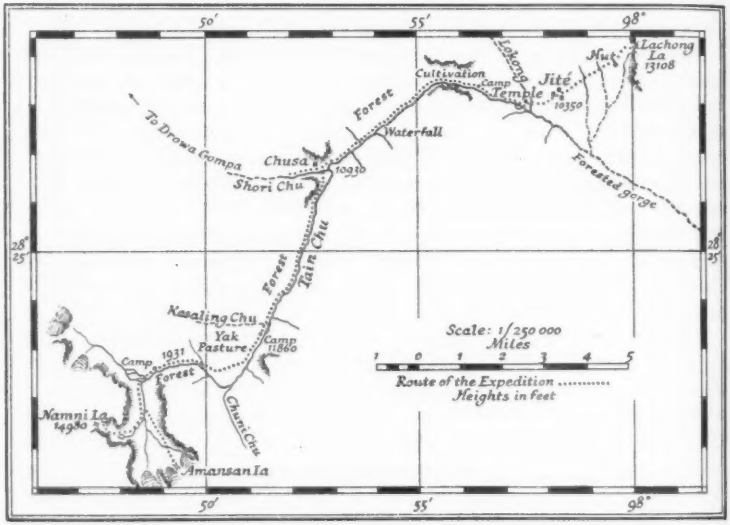
Every summer the Namni La is crossed by numbers of Tibetans, Lisus, Darus, and even Chinese, attracted to these inhospitable mountains by two things: the bulbs of a small alpine Liliaceous plant (*Fritillaria Roylei*) called *pai-mu* by the Chinese, and valued for its medicinal properties, and the skins of such animals as the gooral and serow. People come from as far east as the Mekong. The Darus, in turn, cross the pass to buy salt, clothes, cooking vessels, and cattle from the Tibetans. During July and August a considerable number came over and spent a fortnight in the upper Adung valley and its tributaries digging for bulbs.

Having persuaded ten of these people to carry loads for us on the return journey, we started on September 1 for the first Tibetan village on the other side, called Jité. It was a very wet day, with bad visibility. From near the foot of the glacier at the head of the Adung valley, the path turns due east, ascending precipitously to a hanging valley, whence the Namni Pass is reached over a snow-bed. The height is about 15,300 feet, and there is no view from the summit. Descending a precipitous scree and crossing a snow-bed we reached a beautiful glacier lake about 1500 feet below the pass, the water from which fell over a cliff into a larger valley. Descending steeply again, we saw three

[1] See "A Note on Deglaciation in Tibet," *Geological Magazine*, June 1927, where I estimated the total known glaciated area in the "river gorge region" at a quarter of a million square miles, and the total amount of ice melted at 139 billion cubic feet.

[2] See Murray Stewart: various papers in the *Records of the Geological Survey of India*.

glaciers at the head of this valley, which we followed down to where the trees began, and here we camped. A large stream came in here from the west, and up this valley we noticed a fourth glacier. The alpine country on this side showed much deeper scars of ice work than the Adung valley, and it seems likely that it was more recently under ice. The main river was now flowing about east-south-east, and again it dropped very steeply over ice-smoothed granite rocks into a still larger valley, where it joined a river flowing north-north-east, which also probably rose amongst glaciers. A short march on September 2 brought us into this main valley, and we camped at midday in a huge flat pasture (a silted-up lake basin) over which scores of yak, sheep, and goats grazed. This meadow is known as Kasali; it is about $1\frac{1}{2}$ miles long and $\frac{3}{4}$ mile wide, at an altitude of 12,000 feet. Owing to the weather, survey work was



Route from Namni La to Jité; from a prismatic compass sketch by Lord Cranbrook

reduced to a compass traverse, faithfully kept by Cranbrook, who also obtained all the topographical information he could.

On September 3 we marched down the valley at first in a direction north-north-east, gradually changing to north-east and finally east. There is a good mule path all the way. After about 2 miles we crossed a large river—Shori river—from the west, by a good wooden bridge. There is a road up this river which leads to Drowa Gompa. It must therefore cross the Irrawaddy–Lohit divide, and probably reaches the Lohit in the neighbourhood of Chikung. This is the direct road from the upper Adung valley to Zayul. After marching some miles we camped in the forest, and next morning, continuing eastwards, we crossed another big river from the north-west, called Lokong Chu. This Lokong river, and the main river below the Shori junction, are about the same

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Michelia doltsopa and temperate rain forest in the Adung valley at 6000 feet; March

Aster sp. in the Adung valley at 12,000 feet; August

Saussurea sp. in the Adung valley at 14,000 feet; September

Aster sp. in the Adung valley at 12,000 feet; August

Saussurea sp. in the Adung valley at 14,000 feet; September

size; the combined river is, or was at this season, a formidable stream, as big as the Adung river at Adung Long. After crossing the Lokong river we ascended 1000 feet or more, to the village of Jité. From Jité the road leaves the river, which turns south of east, and crossing two more tributaries reaches Ridong, on the Kalaw river, in three marches. (See Survey of India, Sheet 91 H.)

I turn now to the question of the source of the Irrawaddy. On his journey from China to Assam in 1911 Bailey crossed two or three of the Irrawaddy headwater streams (*op. cit.*). The first one he reached he describes as 20 yards wide (on June 17 when it would be full of snow water). Bailey calls this an upper branch of the Irrawaddy, and was told that it flowed to a country called Lhoka or Tsong. Lhoka sounds suspiciously like our Lokong. Though he does not mention it, Bailey evidently passed through or close to Ridong. He followed this river (the Kalaw ?) for two days, until it was only about a yard wide, and then crossed the Tsong La. The river he had been following so far rose just north of the pass in some snow-covered hills. For some obscure reason the Survey of India have projected the main branch of this river some 16 miles beyond, east and north of, the Tsong La (Sheet 91 H), though Bailey's statement is explicit. Any one with any knowledge of this country knows that a stream a yard wide in mid-June is likely to have its source closer at hand than that. The map is therefore probably based on that of Bacot. After crossing the Tsong La, Bailey reached a river which flowed due south, "and must be the headwaters of the Tarawan, which passing through Hkamti Long, joins the Irrawaddy." Bailey's Tarawan is obviously the Taron wang; and it is this stream which is our Lokong river. Thus the eastern branch of the Irrawaddy, or Taron river, has four headwater streams—the Kalaw, Lokong, Kasali, and Shori. We do not know which is the largest, but the Kalaw, hitherto regarded as the source stream, is obviously smaller than the combined Kasali, Lokong, and Shori streams, and the ultimate source must be sought amongst the latter. The Lokong river appears to be longer than the Kasali branch; but at the junction I could see little difference in volume, though it is of course impossible to judge. A river like the Irrawaddy has in fact several sources, and we certainly had the satisfaction of discovering one of them.

Jité is a small village of three wooden, slat-roofed houses, and one or two storehouses, standing amidst permanent cultivation on a shoulder of the mountain at an altitude of little under 11,000 feet. It is thus very much higher than Tahawndam. The inhabitants—Tibetans and a few Daru slaves—were rather shy of us at first, and held aloof; but after a few days they plucked up courage and sold us food as required, including turnips and potatoes; but transport to Ridong they refused, and here we stuck. The weather was atrocious throughout the fortnight we remained, and we were never favoured with a view in any direction. One thing was rather remarkable, and that was the difference in the flora on this side of the range; indeed I had noticed it almost as soon as we crossed the pass. We might still be in the Irrawaddy basin, but we were undoubtedly no longer in Burma. Imagine cultivation at nearly 11,000 feet, in Burma, to start with! In view of the far smaller rainfall on this side we hoped that September would be fine, but it rained persistently,

and by the middle of the month many of the trees were flying signals of autumnal distress.

On September 20 we broke camp, and with ponies to carry the baggage started for our Burma camp. The ponies had to be left at Kasali, coolies taking their place; and on September 23 we recrossed the Namni Pass in a deluge of rain, and reached our alpine camp. We had left a certain amount of food here, but not very much, and when our Tibetan coolies had departed, Cranbrook, our cook, and I found ourselves rather stranded. It was five marches to the village, and the headman, who was expected to meet us here, had not arrived, nor had a man we had sent to Fort Hertz with our mail. I had a fortnight's work seed collecting in prospect, and was in no mind to go down the valley, so Cranbrook undertook to return to the village and get help. He left on September 25 and reached the village on the 29th. A few days later coolies reached me with rations, enabling us to remain on in the alpine camp (12,000 feet) till October 19. The weather in October was the best we had had since the beginning of June, and there were quite a number of alpines in flower. On the 19th we started down the valley for the last time, with coolies who had come up to help us, and that evening I rejoined Cranbrook, whom I found in a new camp at 10,000 feet. Here we were marooned for a week, waiting for transport, and the weather breaking again we were far from comfortable. With relays of coolies we finally reached our base camp and the village on November 2. But it was a week later before our cook and the kit, which we had abandoned in the upper camp, arrived. Meanwhile the man we had sent to Fort Hertz with our mail had returned, and by the second week of November we were a reunited party.

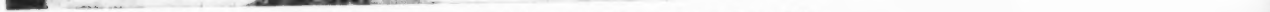
On November 20 we broke camp for the last time and started back for Fort Hertz, reaching the Seinghku confluence and a comparatively decent track on the 23rd. Retracing our steps down the Tamai valley, we crossed over into the western Irrawaddy on December 1, and nine days later reached Fort Hertz, after an absence of just under a year. We spent a busy five days here, sorting and packing our collections of plants, seeds, mammals, birds, snakes, and insects, and on the 16th we set out on the last lap of our journey. We reached Myitkyina on New Year's Day, 1932, after an absence of just over thirteen months.

It will be some time yet before our collections are classified and named, but meanwhile it is possible to summarize some of the results of the expedition in a general way. Two problems present themselves when we come to consider the distribution of animals and more particularly plants, in south-eastern Asia. Which of the two great mountain systems—the east-west Sino-Himalayan system, or the north-south Sino-Malayan system—has mainly influenced distribution in south-east Asia: (i) in so far as a mountain system acts as a barrier, (ii) in so far as a mountain system acts as a carrier? (It may be remarked, in passing, that a great mountain system such as either of the above is itself a geographical area with its own endemic flora.) In other words, what are the relationships between the three botanical regions which are divided by, and also traversed by, these two mountain systems? The facts point to a continuous east to west flora, extending from the north-west Himalaya, eastwards through Bhutan, thence across the river system from the Tsangpo to

Rhododendron vesiculiferum in the Adung valley at 8000 feet; May

Gentiana gilvostriata in the Adung valley at 13,000 feet; October

Rhododendron Nuttallii in the Adung valley at 6000 feet; May



Rhododendron Nuttallii in the Adung valley at 6000 feet; May

the Yangtze, through China to Japan and Formosa, rather than through Burma, the Malay Peninsula, and the East Indies; and this irrespective of any mountain barrier running north and south across the axis of extension. This view is strengthened as a result of our explorations and collections on the upper Irrawaddy. Thus, although the north-south ranges are such a conspicuous feature on an orographical map of south-east Asia, they have proved singularly ineffective in checking the east-to-west movement of the flora, or in advancing its north-to-south movement. We did however observe examples of this last movement, every one of which is striking.

This conclusion is of some importance in view of the much greater age of the Sino-Malayan mountain system. It indicates that the present distribution of animals and plants over south-east Asia is a geologically recent phenomenon, since it must obviously be post-Himalayan. But it is really much more recent than that. It was the advance and retreat of the ice in quite modern times which made for the present distribution, and which further accounts for most of the endemism in the mountain flora. It may be doubted indeed whether we can have any idea of the flora or its distribution here in pre-glacial times. What we see is the ultra-modern; even the recent is obliterated and a matter of conjecture. Our explorations at the sources of the Irrawaddy furnished further proofs of the great ice retreat (and of its one-time vast extension) throughout the mountains between the Brahmaputra bend and the Yangtze. We explored the upper Adung valley, crossed the pass at its head (thus proving a direct route from Burma into Tibet), and found one of the three sources of the Taron, besides disentangling other headwater streams. It may be pointed out here that the Diphuk La, at the head of the Seinghku valley, is the direct route from Burma to Rima and lower Zayul; the Namni La is the direct route to upper Zayul, *via* the Shori river, and to Tsarong and north-west Yunnan, *via* Ridong. The district round Jité and Ridong is neither Zayul nor Tsarong, and appears to be nameless. Finally, we discovered a number of glaciers, two at the source of the Adung river, and at least five at the source of the Jité river, proving how glacier-fed the eastern Irrawaddy really is.

Our collections of plants, animals, and birds are being determined at the Natural History Museum, and full details will no doubt be published later elsewhere.

APPENDIX

NOTES ON THE NATURAL HISTORY COLLECTIONS by members of the Staff of the British Museum (Natural History).

A. MAMMALS. By Guy Dollman.

During their expedition to Upper Burma Lord Cranbrook and Captain Kingdon Ward collected some three hundred mammals, many of which represent very rare genera, and names will have to be found for four new forms contained in the collection. The latter include a new gooral from the Adung valley, with which it is proposed to associate the name of Lord Cranbrook, and a new squirrel, which is to be named after Captain Kingdon Ward. There is also a bat of the genus *Myotis* and a species of the genus *Rattus* which require description. Accounts of these various new forms will appear in the *Annals and Magazine of Natural History* in due course. Two species of monkeys are contained in the collection, namely *Pithecus shortridgei* and *Macaca nemestrina*. *Pithecus shortridgei*

is a grey-coloured langur monkey allied to *Pithecus pileatus*, but entirely lacking the buff tint of that species. It was originally described from Homalin, Upper Chindwin, Burma, by the late Oldfield Thomas and the late R. C. Wroughton. The Pig-tailed Macaque, *Macaca nemestrina*, is represented by two specimens, a young one from the Adung valley and a part of a skin made into a native bag along with a portion of skin from the new species of gooral, from Nam Tamai.

Four species of bats were obtained and no less than ten genera of Insectivora. Amongst the latter are some exceptionally rare forms. Three specimens of the squirrel-like Tupaia, or tree-shrew, were obtained in the Hkamti Plain and Nam Tisang. This is the common Chinese tree-shrew described by Anderson from West Yunnan. The family Talpidae is represented by three genera, namely *Parascaptor*, *Scaptonyx*, and *Rhynchonax*, the latter two being very rare genera hitherto known only from a few specimens. The genus *Scaptonyx* was founded by Milne-Edwards on material from Kokonor and Szechwan, and the specie was described as *Scaptonyx fusicaudata*. Some years later Oldfield Thomas described under the name of *Scaptonyx fusicaudata affinis* a new race of this species from Atungtsi in the drainage area of the Upper Mekong. The only other specimen of *Scaptonyx* in Museum collections is one collected by the late Mr. Forrest from the Mekong–Salwin Divide which has been referred to this subspecies. The present specimens, some three in number, came from the Adung valley, and therefore may be looked upon as identical with *Scaptonyx fusicaudata affinis*. It should be noted however that all three of the new specimens have considerably longer tails than the type of *affinis*, but I do not feel justified in attaching any systematic importance to this character in view of the geographical side of the problem. *Scaptonyx*, like *Rhynchonax*, is one of the members of the family Talpidae which imitate the shrews, being more like a shrew than a mole. *Rhynchonax* was described by Oldfield Thomas as a new genus in the year 1911 on material sent home by Mr. Malcolm Anderson during the Duke of Bedford's exploration of Eastern Asia. Two specimens of this rare genus are included in the collection, both from the Adung valley, so that the distribution of *Rhynchonax* is now known to be considerably more extensive than was formerly thought, the typical series of *andersoni* coming from Omisan, South Szechwan. *Rhynchonax* is closely allied to the genus *Urotrichus*, with which are associated the genera *Uropsilus*, *Nasillus*, *Dymecodon*, and *Neurotrichus*.

Amongst the shrews are fine series of the two Giant Water-shrews belonging to the genera *Nectogale* and *Chimarrogale*, which appear to be referable to the species *Nectogale sikhimensis* and *Chimarrogale styani*. Of the true shrews a large series of the striped shrew-mouse was collected in the Adung Valley and another rare species found in the same locality was the short-tailed *Blarinella wardi*, named after Captain Kingdon Ward by Oldfield Thomas in 1915. The type of *Blarinella wardi* was collected at Hpimaw, Upper Burma, at about 8000 feet, the genus having hitherto only been recorded from Western China. A specimen of the long-tailed shrew-mouse, *Soriculus irene*, was also obtained in the Adung valley district. This latter species has an enormously long tail compared with the length of the head and body; in the type specimen the head and body measure 60 mm. and the tail 90 mm., and in the present specimen the tail is even longer, measuring some 101 mm. The type of this species came from Yuenchingsien, South-west Szechwan, and does not appear to have been recorded from any other locality except some specimens from Mount Omi, referred to this species by Oldfield Thomas.

Two large cats were collected at Nam Tamai, *Profelis temmincki tristis* and *Profelis temmincki dominicanorum;* the latter, which was described from Foochow, Fukien, China, has recently been recorded from Laos by Wilfred H. Osgood.

Two palm-civets (*Paguma grayi*), a leopard cat (*Prionailurus bengalensis*), a martin (*Charronia flavigula*), and a panda (*Ailurus styani*), were collected at Nam Tamai and Nam Tisang. Other members of the carnivora in the collection are a wild dog, two species of weasel, and a linsang.

The collection of rodents contains about sixteen different genera including specimens of the giant flying squirrel (*Petaurista yunnanensis*), the lesser flying squirrel (*Hylopetes alboniger*), the giant squirrel (*Ratufa gigantea*), the long-nosed squirrels (*Dremomys pernyi* and *Dremomys macmillani*), and two species of striped squirrels of the genus *Tamiops*. There is also a large series of the red-bellied squirrel (*Callosciurus erythroeus*) and two specimens apparently representing an undescribed form of the genus *Tomeutes;* these latter came from the Kachin Hills and a description of the characters will be published in due course. Among the rats is an interesting new species and about six other species of the genus *Rattus*.

The ungulates are represented by three Chinese muntjacs, a serow (a subspecies of *Capricornis sumatrensis*), and the new gooral. This latter form, a description of which will be published in due course, is a very handsome animal, and Lord Cranbrook and Captain Kingdon Ward are to be congratulated on securing such a fine new species. The type came from the Adung valley and a fragment of skin apparently belonging to the same species forms part of a native bag obtained at Nam Tamai.

B. REPTILES AND AMPHIBIANS. By Dr. Malcolm Smith.

The collection of Amphibia and Reptiles, although not large, is of considerable value. The region visited is of particular interest in that it is the meeting-place of the true Himalayan and the Trans-Himalayan faunas, the latter being mainly of Chinese origin. Altogether seven species were obtained. Among the Himalayan species, whose range is now extended farther east, are *Rhacophorus maximus*, one of the largest of the Indian tree-frogs, *Scutiger sikkimensis*, an interesting toad that has not hitherto been found below 14,000 feet altitude (this specimen was collected at 12,000 feet), and a Pit Viper, *Trimeresurus jerdoni*.

Two snakes with a wide range in Southern China were obtained, namely, *Natrix nuchalis* and *Elaphe mandarina*. The only lizard collected was an *Agamid* of the genus *Calotes*, and it proves to be new to science. It was caught in camp in the Adung valley, altitude 7000 feet. I have pleasure in naming it after the leader of the expedition. A description of this lizard will appear in the forthcoming volume on Lizards in the Fauna of British India series.

C. BIRDS. By N. B. Kinnear.

The collection of birds consists of some 152 specimens belonging to 92 species, and of these over a dozen are new to the Burmese list. One, a Bar-wing, is a new race of the Hoary Bar-wing of Nepal and Sikkim. Many of the birds are intermediate in character between those found in the Himalaya and Yunnan. Among game birds there is a Temminck's Horned Tragopan, with curious brilliant blue horn-like processes of skin on either side of the head; two young birds of Sclater's Monal; Kusier's Blood Pheasant, and a Black-breasted Kalij Pheasant. Pigeons include two species, the Snow Pigeon, and the large Grey-headed Imperial Pigeon. The only wading bird is a common Sandpiper obtained on migration on November 30 at Trang, near Myitkyina, while a Teal—a winter visitor to the Adung valley—was shot on February 27. A Burmese Barred Owlet is the only bird of prey in the collection, but the Woodpeckers are represented by three kinds of Pied and a beautiful Rufous Piculet, a miniature Woodpecker about the size of a Nuthatch. Of Sunbirds there is the brilliant Yunnan fork-tailed Sunbird, also Dabry's Sunbird with a brilliant scarlet breast and metallic purple

head, and the more sombre coloured Nepal Yellow-necked Sunbird ranging from Sikkim to Yunnan.

Two examples of Hodgson's Wagtail were obtained in May, and probably breed in the district. The Finches include several interesting species, but three examples of the Himalayan Siskin call for special mention, since, before Forrest obtained a single male on the Lichiang Range in 1925, it was only known from six specimens in the British Museum from Sikkim. There are several small Willow Warblers and two kinds of Thrush, one of which, the Black-throated Thrush, is a migrant from the north and has occurred in the British Isles as a straggler. A Wren indistinguishable from that of Nepal is represented by a single specimen, and there are two Brown Dippers similar to our bird but of a uniform brown all over. Among the Timalidae there are two birds of striking colour, the beautiful little Fire-tailed Mixornis, green all over with the outer webs of the tail edged with red, and Hodgson's Grandala, the size of a Thrush and of a deep violet-blue colour; this last was previously known only from the Himalaya and Szechwan. Of the true Babblers, three out of the five species have not previously been recorded outside Yunnan. The Tits include a miniature Long-tailed Tit, a race of our Cole Tit, and a Crested and Green-backed Tit. Among the Corvidae there is a form of the Indian Jungle Crow; a beautiful long-tailed blue-and-white Magpie, with a red bill; and a Green Magpie, or Hunting Crow, in which the yellowish-green colour changes after death to a dull blue.

D. INSECTS. By K. G. Blair.

Mr. N. D. Riley reports of the butterflies, on a preliminary examination, that they are all known species but include some interesting forms and that their affinities are entirely with Western China, not at all with India or Indo-China (*i.e.* Eastern Palaearctic, not Oriental).

The Diptera consisted mainly of Tipulidae, of which Dr. F. W. Edwards finds forty species, almost all undescribed. The identified species are *Tipula hingstoni* Edw. recorded from Mount Everest and *T. wardi* Edw. from Southern Tibet. (The latter is probably identical with *T. splendens* Brun. from Garhwal.) The others show no noticeable affinity to Indian or Indo-Chinese forms, but several of them are allied to species known from northern Yunnan or Szechwan; others are related to European forms.

The Bumble-Bees have been examined by Dr. O. W. Richards, and show affinities with the Himalaya.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH) said: That great river, the Irrawaddy, a free translation of which I believe to be "the container" or "possessor of water," and which forms one of the great highways of Burma, though not, as many people think, part of its irrigation, has its source somewhere about the 28th or 29th parallel of latitude. I say "about," for, unless Mr. Kingdon Ward has discovered its source during his recent journey, the real source of the Irrawaddy is unknown. As the crow flies it is many miles from the mouth of that river, and as the river runs it is 1300 miles, for a thousand of which from its mouth it is navigable by good-sized steamers. I mention this to show how important the source of such a river is. It is the headwaters of that river of which we are to hear to-night, and we are to hear of them from one whose travels and investigations have made him one of the greatest authorities that we could call upon.

Mr. Kingdon Ward was at St. Paul's School, and after that at Christ's College, Cambridge. He started his journeys early, for in 1907, though you might not

think it to look at him, he was in Shanghai. He crossed China in 1909–10, and began plant-hunting in 1911. In 1913–14 he was travelling about Yunnan and the Burmese frontier, and after serving in the war he went back to Burma and made many journeys there. He went to Western China and found new routes back from those parts in 1924, 1926, and 1928. Then he explored certain portions of Assam and the frontiers which approach to those places, and in 1929 he made a very interesting journey through Indo-China across to Hanoi on the Annam border. In 1931 he and his companion, Lord Cranbrook, who is here to-night, were the first Europeans to reach the Tamai pass that leads into Tibet, but just missed joining up with the route followed by Colonel Bailey as he came down towards the south and west in 1911. It is of that journey that I will ask Mr. Kingdon Ward to tell us now.

Mr. Kingdon Ward then read the paper printed above, and a discussion followed.

The PRESIDENT: Although I said it in introduction of Mr. Kingdon Ward I think it will bear repetition, that is, that he and Lord Cranbrook were the first two Europeans to look over the Tamai pass into Tibet. Any new expedition of that kind bears the mark of the pioneer which we like to honour so far as we can in this Society. Lord Cranbrook is here this evening. I will ask him to address us.

Lord CRANBROOK: It is extremely embarrassing to follow Mr. Kingdon Ward because he always does things much better than I do. You have seen his photographs, but you have seen none of mine because none of them came out. I was following him the whole time and I am going to do the same now.

As he said, my job on the trip was mainly zoology. I do not know whether you realize what are the trials of a zoologist's life out in Burma. I am devoted to roast duck, and one thing I love more than any other is the nice brown fat skin. When one shot a duck and had to take that skin off for the Museum it almost broke one's heart, and when one brought it home to be told it was a common teal one's heart was completely broken. We got a few birds and a good few mammals, but, as Mr. Kingdon Ward said, most of the mammals are very small. I used to carry a rifle all over the place, a shot-gun, a catapult, and a butterfly-net. I did far more with the butterfly-net than with the rifle. We got one new big-game animal, a new species of gooral. Apart from that the animals were all previously known.

Kingdon Ward showed how four areas meet in the district we traversed: those areas are Tibetan, Chinese, Malayan, and Indian; and he told you also that the flowers are very largely Tibetan and Chinese. In the same way the Chinese forms seem to predominate in both the birds and the animals. It is too soon to say anything definite yet because it has not been possible to work out the animals. We carried an enormous quantity of tackle to collect snakes and frogs and such things but were very unsuccessful. Snakes and frogs hid themselves whenever we approached. We brought back four snakes, one frog, and two of the most delicious and enormous slugs you have ever seen. They were absolute gems, but they are set as hard as rocks and nobody has found out what they are.

The PRESIDENT: You have heard Mr. Kingdon Ward speak of the governors of Burma. We have one here to-night, Sir Harcourt Butler. I will ask him to address us.

Sir HARCOURT BUTLER: I feel that I cannot add anything very important to the delightful addresses that you have already heard, but your President told me, and we all have to obey the President, that he wished me to say something about the lower reaches of the Irrawaddy. Mr. Kingdon Ward told us about the Irrawaddy as far south as Myitkyina.

The Irrawaddy is still the great highway of Burma. Lord Dalhousie, one of the greatest and most far-seeing of the Governors-General of India, added

Lower Burma to the British Empire after the Second Burmese War in 1852. It was one of his main objects to open the Irrawaddy to the commerce of the world. He called it, and it still is, a mighty avenue. The opening of the Suez Canal in 1869 completed the transformation of Burma; a great demand was set up for rice and other grain and raw materials, and the Irrawaddy from that day has been a very great highway of commerce. I swam across it somewhere about 200 miles below Myitkyina, where it was so rapid a stream that I was carried at least three-quarters of a mile down to the bank on the other side before I could land. I should not swim it now! I was told then there were no crocodiles, but towards the end of my time in Burma I did find a crocodile in a tributary of the Irrawaddy. The river is not however infested with crocodiles, as are the rivers of India. There are a few at the mouth. How they get there is not quite known. There is another difference as compared with the Indian rivers, and it is that the porpoise of the Irrawaddy is quite a distinct species from the gangetic porpoise which is found not only in the Brahmaputra and the Ganges, but also in the Indus. Geologists tell us that the whole of Northern India was once a great sea or lake.

The Irrawaddy at Mandalay has become rather a slower stream. Down to this point its course is fairly straight. Then it begins to meander. Mandalay is about 250 feet above sea-level, and the Irrawaddy runs over 700 miles from there before it reaches the sea. There are great variations in the level of the river. Between the lowest watermark and the highest flood-mark at Mandalay I think, speaking from memory, there is about 40 feet. Southern Burma is one vast rice plain through which the Irrawaddy discharges itself in innumerable streams. Hitherto we have not used the Irrawaddy for irrigation. The water is wanted to keep up the steamer service which is an excellent service run by the Irrawaddy Flotilla Company. The area of land to be irrigated between the hills and the river is said by engineers of Indian experience to be insufficient to make it worth while to develop a big irrigation scheme. We are making railways and roads, and in time no doubt the Irrawaddy will cease to be the important highway it is at present, and then perhaps its waters will be used for irrigation and also for water-supply to the towns.

The Irrawaddy is a beautiful river. You see all sorts of craft on it, canoes, sailing-boats, a sort of dhow, what they call sampans, and rafts with which they bring teak wood down to the coast. It takes five years to get a teak tree to the coast. The wood is so heavy that they have to kill it before it will float. A notch is cut round the base of the tree something like 6 inches deep. That lets all the sap out, and after three years the tree is felled and dragged to the nearest stream which flows into the Irrawaddy or other big river. The trees get jammed and they then use elephants and buffaloes to pull them out. Once the logs reach the big rivers they are made up into rafts with bamboos and other lighter woods, and they float slowly down the river to the coast.

The sunsets on the Irrawaddy are famous. Life there is very peaceful. People enjoy life and wear bright garments. They are altogether a most charming race. This is all I have to say about the lower end of the Irrawaddy, of the higher reaches of which we have heard in Mr. Kingdon Ward's and Lord Cranbrook's delightful addresses.

The PRESIDENT: Mr. Kingdon Ward, the size of this audience will have shown you when you began how eagerly we looked forward to your lecture, and I can assure you, both on my own behalf and on behalf of everybody here, that we have not been disappointed in your remarks, nor in any of the very lovely pictures which you have shown us. If we have one further wish, when you go again to that part of the world you will be able to satisfy it, for by then I hope we shall be able to supply you from this country with some plates for coloured photographs.

I know when you went last time you tried to take some and that something went wrong with them.

I was very glad to hear you give such praise to the maps of the Survey of India. There is a member of the Indian Survey here this evening, and he tells me that he would like to tell you how gratified he is to hear that those maps are correct. From time to time there have been criticisms of the maps, I will not say of the main features, but of some of the details of the maps, and it must be a great satisfaction to those concerned to know that you have found them so accurate.

You heard Mr. Kingdon Ward speak of the trials of travel to a middle-aged man. I am told by his companions that that is not the trouble they find. On the contrary, they wish he would take things a little easier sometimes so far as they are concerned. Some one remarked to me to-day: "Oh, Kingdon Ward, by Jove! You know, he really is as hard as nails." I am going to take advantage of my age and my position as President to tell Mr. Kingdon Ward that when he goes again we hope he will look after himself a little more, because we want to get a great deal more out of him yet. We do not want to see him breaking himself up unnecessarily.

I have not been in those parts myself. Very few people have. My business here is, as always, a very delightful one, and that is to convey the thanks of this audience to Mr. Kingdon Ward and Lord Cranbrook for a very charming evening. I did not mention before, and perhaps it is unnecessary to remind you now, that Mr. Kingdon Ward is a Gold Medallist of our Society; and after the way in which he has delivered his lecture, with no mention of hardships, difficulties, and dangers encountered, you may not be surprised. I beg you to accept, therefore, Mr. Kingdon Ward, our most sincere thanks for the admirable work you have done and for the delightful and, may I say, modest way in which you have described it.

THE HISTORICAL GEOGRAPHY OF THE TOWN, PORT, AND ROADS OF WHITBY

W. G. EAST

"At the entrance of a little nameless river, scarce indeed worth a name, stands Whitby, which, however, is an excellent harbour, and where they build very good ships for the coal trade, and many of them, too, which makes the town rich."—Defoe: 'A Tour Through England and Wales' (1724).

THE historical geography of Whitby, successively abbey town, port of refuge, and seaside resort, is the study in miniature of the persistent exploitation, in accordance with the changing needs and ideas of the day, of limited but distinctive natural resources. The mediaeval abbey town was very small in scale. As a port, alike in the Middle Ages and in modern times, Whitby has never approached first-class importance, for the essential geographical factors requisite for great commercial activity in these contrasting periods were lacking. The great mediaeval ports of England, such as Boston or Kingston-upon-Hull, were connected by good river-ways with hinterlands which were well settled and rich in pastoral or agricultural products. Great modern ports are usually conditioned by densely populated and highly industrialized hinterlands. The hinterland of Whitby satisfied neither of these requirements. It has no coalfields, while it has wide stretches of barren, heather-clad moor, which leave the actual area of land suitable for pasture or cultivation relatively very small, and settlement in consequence is scanty. Further, the river Esk, on which it stands, not only failed to provide a route-way into the interior but presented a real obstacle to movement. It is rapid in current and normally shallow, although liable to frequent and violent floods, and could be navigated during high water only as far up as Ruswarp. Its valley tends to be gorge-like, where it has cut through the boulder clay and notched the underlying more resistant Lias or Oolitic rocks; its flood plain, in the few places where it occurs, is extremely narrow; and its drift-floored dale and tributary valleys, though potentially good pasture or arable land, are restricted in value by the moorland on their upper slopes. Seawards however the physical obstacles to movement by land are lacking, and there were the easiest route-ways from the town. Moreover, in its coastal situation Whitby enjoyed one signal geographical advantage: on a rocky, inhospitable coast, along which lay a much frequented sea route, it possessed at high tide the best harbourage between Scarborough and the Tyne.

The site of Whitby was conditioned in particular by two related physical facts. In the first place, geological faulting occurred along a north–south line on the eastern side of the present Esk mouth, with the result that the Upper Lias sandstones and underlying shales were let down 200 feet to the west of the river (Fig. 1). Here the sandstone quickly disappears beneath the surface, and the cliff is composed of superimposed boulder drift, which has given rise to a beach of fine sand and gravel, in contrast to the rock-strewn foreshore across the estuary (Fig. 2). In the second place, it appears that the river Esk abandoned its pre-glacial channel below Ruswarp, and instead of flowing north-westwards to enter the sea to the east of Sandsend, ran more directly to the sea at Whitby,

by cutting just above Whitby, in post-glacial times, a gorge through the lower Oolite, following the line of fault noted above. This deviation of the Esk is attributable to the glaciation of the country around Whitby, although it does not seem clear whether the river abandoned its old channel, because it was packed with boulder clay, or whether alternatively it merely took a course along the outer edge of the ice.[1] In either case, it seems likely that the Esk diversion along the line of the "bottle neck" above Whitby and thence into the present estuary within the town is to be related to the north–south faulting.[2] (In Fig. 2 soundings are given in feet at low-water spring tides; underlined figures on dry banks in feet above low-water springs (springs rise 15 feet, neaps rise 11½ feet at the bar). Harbour lights are shown on the pierheads from two hours before to two hours after high water, when it is safe to enter. The piers shown were those existing at the time of Commander Richard's survey (1894), and have since been extended.)

In the last mile of its course the Esk strikes due north, and as it leaves the steep-sided narrows immediately above Whitby the valley opens out, although the flood plain, confined between sharply inclined slopes, is generally narrow.

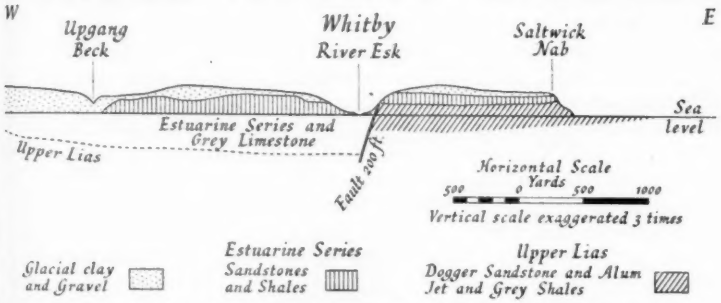


Fig. 1. Section showing faulting on the east side of the Esk mouth

The flood plain is narrowest at Whitby bridge, a spot where bridges, built at the expense of the county or of the urban district, have stood certainly from the sixteenth century onwards, while there are records of earlier bridges which were built, it would seem, a little above the site of the contemporary St. Ninian's chapel.[3] The flood plain is at its broadest above the bridge to Boghall, where on the west side extend the Bell shoals which dry at half-ebb, and where the principal harbour of the town lay. Below the bridge, as a result of the wastage of the cliffs both within and outside the estuary, the river mouth has been widened since the earliest settlement was made, and the town has been brought closer to the sea. From the estuary on both sides the land rises steeply. On the east side an almost sheer ascent is made to a small plateau, covered with boulder clay, sands, and gravels, which lies between high sea

[1] P. F. Kendall, "A System of Glacier-Lakes in the Cleveland Hills," *Quart. Journ. of the Geol. Soc.*, vol. 58 (1902), p. 534.

[2] F. R. C. Reed, 'The Geological History of the Rivers of East Yorkshire' (1901), pp. 15. 45.

[3] 'Victoria County History, North Riding,' II, 511.

cliffs to the north and the small but deeply trenched valley of the Spital Beck to the south. This plateau possessed natural defences except to the south-east, and had in addition a natural and still active spring. It was the site of the Anglian settlement of Streoneshalh and of the monastery, for both monks and nuns, which was founded by the Princess Hilda about the year A.D. 657. There, too, was established, soon after the Norman Conquest, the Benedictine Priory, technically an abbey only after 1100, of which much of the thirteenth and fourteenth century building survives. On the west bank the ascent is more gradual to the lower West Cliff. Glacial drift has weathered here, as on the

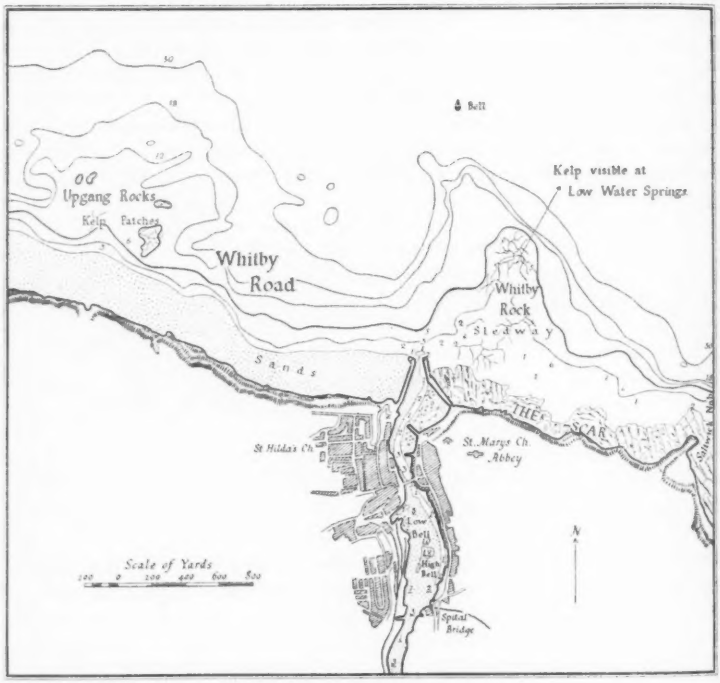


Fig. 2. Whitby Harbour and its approaches

East Cliff, into a heavy, barren clay soil, which was enriched in the eighteenth century and during the Middle Ages by kelp, made from the burning of seaweed found at low water on the off-shore rocks. The early occupied site lay well back from the cliffs, and was limited southwards by a small valley, the "Slike" or Bagdale Beck, which is shown as an open stream in eighteenth-century plans of the town and was accessible to cobles at high tide.[1] Bagdale Beck formed the southern limit of the town right through the eighteenth century, and has left its name in Bagdale (street), whilst Baxtergate, one of the

[1] R. Weatherill, "The Ancient Port of Whitby and its Shipping" (1908), p. 26.

few original streets of the town, runs along the northern side of its valley, parallel to the now vanished stream.

The early history of Whitby can be briefly sketched. St. Hilda's monastery and the Anglian settlement were partially destroyed by Danish invaders *c.* A.D. 850, but it is clear that the town must have revived under Danish influence, and the high assessment for Danegeld in 1066 recorded in Domesday Book implies the development of commerce. The town was renamed by its new inhabitants first Prestebi (= priests' farm) and then Witebi (= Hviti's farmstead), and grew up on both sides of the river, at the foot of the eastern plateau on which stood both the parish church of St. Mary's and the Norman abbey, to which the port belonged. The port contributed one ship in 1322 to serve for six weeks during the Scottish war. Fishing was early its chief activity, the abbey receiving tithes on fish brought into the town. Salt was imported from the Tyne, and salted herrings were exported or sent inland from Whitby.[1] The earliest fish market stood on the abbey side of the river, and a fish pier was built there in 1790, but later the fish market was moved to the west side of the town, where the present fish quay stands. Some coal was brought from the Tyne to supplement the wood and turf fuel used by the abbey, while freestone was brought probably from nearby quarries at Sneaton and Aislaby for the abbey buildings. The old market was in the western part of the town, where Flowergate, Baxtergate, and Haggersgate ("gate," Old Norse = street) converged on the bridge and St. Ann's staith. The ford from Boghall to the Spital Beck was doubtless used, and according to Charlton a passenger plank bridge stood there later, until it was removed to enlarge the harbour. There is a twelfth-century record of a bridge across Spital Beck near its mouth. The abbey lands stretched up the Esk valley to Ruswarp, which, as now, had a mill, and extended southwards to include much boulder drift-covered country and some moor, as far as Hackness. Whitby had a fair and a small market for agricultural produce, and indeed agriculture and grazing long remained occupations of the town itself: fields within the town are shown on a town plan as late as 1778, while it is significant that the word "Flowergate," the chief street of the town, is interpreted to mean "the cow stalls' road."[2] Mediaeval Whitby was, of course, a very small settlement and port compared with Newcastle and Hull, the two "staple" ports from which, by an Act of Parliament in 1353, the chief national exports—wool, wool-fells, leather, and lead—had to be shipped. At the dissolution of the abbey in 1539 it consisted merely of about one hundred scattered houses in or around Church Street, Flowergate, Baxtergate, and Haggersgate.[3] Leland writes of its little harbour and pier and of its fishing activity at this time, and in 1544 the port owned only seven small ships besides fishing boats. Greenville Collins does not include a chart of Whitby in his 'Coasting Pilot,' published in 1693, although Hartlepool, Scarborough, and Burlington Bay (Bridlington) were surveyed. Even so, in 1675 Ogilby ascribes to the port one hundred ships, a significant increase, and Whitby was well known at this time for its trade in butter,

[1] R. T. Gaskin, 'The Old Seaport of Whitby' (1909), pp. 205, 208, 210–211.

[2] A. H. Smith, 'The Place-names of the North Riding of Yorkshire' (1928), p. 127.

[3] J. C. Atkinson, 'Memorials of Old Whitby' (1894), p. 202; Gaskin, *op. cit.*, pp. 100–101.

hams, salt fish, and alum. Further, with the development of the alum industry and the improvement of its harbour, the shipping of Whitby rapidly increased.

Harbour improvements began at Whitby during the eighteenth century and were at once a cause and effect of its commercial and industrial advance. The cost of these improvements was borne by various tolls and port dues on ships entered and on goods landed and shipped. These were authorized by various Acts of Parliament, the first of which was passed in 1702, and formed, until they were abolished in 1861, the income of appointed Trustees of Piers and Harbours. The bulk of this income was derived from "passing tolls," paid by all ships, except Yarmouth vessels, which carried coal from the ports of Newcastle, Sunderland, Blyth, and their dependencies. This toll, of a farthing per chaldron (12 sacks) of coal, increased to a halfpenny in 1765, was designed to help maintain the port of Whitby as a harbour of refuge from rough seas and privateers. It was collected at the Custom House of the port from which the ship cleared.

It is well to describe the physical conditions of the port of Whitby, in order to appreciate the improvements which were made during the eighteenth and nineteenth centuries. Opening northwards, the harbour extended southwards to Boghall, being divided by the bridge into an upper and lower section. It was approached from Whitby Roads by a channel which kept to the west of Whitby Rock and Whitby Scar—the remnants of Lias sandstones and shales which, by marine erosion or landslip, had been broken away from the East Cliff in historical times (Fig. 2). There was, in addition, a broad passage within Whitby Rock called the Sledway, which could be used at spring tides by vessels drawing up to 10 feet, if the wind was strongly south-south-east or east. The peculiar conditions of Whitby's harbour and approaches are noted in early pilot books, at least from the sixteenth century. Waghenaer's coloured chart of the Yorkshire coast between Robin Hood's Bay and the Coquet river, published in 1585 in the Dutch edition of the 'Mariners Mirrour,' shows two pier-head lights and distinguishes the rocks and sands which lay below the East and West Cliffs respectively. He notes, in the English edition in 1588, that "the haven or river is barde" and could, in consequence, be entered only at high water; that north-eastwards of the harbour stretches out a "shoalde" (Whitby Scar and Rock) half a league into the sea; and finally, that the water is fairly shallow within the estuary. The edition of Waghenaer's work published in 1622 describes Whitby as "a Peere or Tydehaven, which at low water is dry, so that as then you may there lye dry. On the east side there shooteth off a stoone banck (the Scar and Rock), which you must shunne." A ledge of alum shale rock covered with sand formed a bar at the harbour entrance, and efforts to remove this obstruction to the channel were made *c.* 1750 and again a century later, by blasting the rock. The channel into and through the harbour was scoured by the Esk in flood; it tended therefore to be in good condition after rains, but in bad condition during drought. Wooler's plan of Whitby in 1740 shows a channel of not less than 13 feet up to Boghall at high-water springs; the spring tidal range was 15 feet over the bar at the harbour entrance, so that the harbour lay practically dry at low-water springs. Owing to its northern orientation the port afforded shelter—a rare convenience on this

well-frequented seaway[1] alongside a dangerous and inaccessible coast—especially from southerly and westerly gales, but ships had to beware of the heavy swells to which the lower or outer harbour was exposed, especially if the wind was from the north. It was with the twofold object of checking this swell and increasing the scour at the harbour mouth that from the sixteenth century onwards piers were constructed at right angles to the East and West Cliffs. These objects were difficult to attain: the piers were continually extended or renovated, the tendency being to narrow the aperture between them and to increase their length. Even so, ships sought the greater security of the upper harbour above the bridge, where they lay dry at low water. Big ships necessarily were loaded and unloaded below the bridge, at St. Ann's staith, but above the bridge were many private wharves and warehouses, and a public quay, New Quay, built about the year 1850, on the west side of the town. The bridge at Whitby seems, certainly from the sixteenth century and probably earlier,[2] to have been a drawbridge. Passage through it often caused damage either to ships' tackle or to the bridge itself, which was further exposed to the violence of Esk floods. The aperture of the bridge was however widened in 1835, when a stone swivel bridge replaced the earlier wooden "leaf" bridge, and allowed ships to ride through on the tide with their sails set.[3] The opening was still further widened when the present steel, electrically worked, swivel bridge was constructed in 1909.

The activities of Whitby as a port had a distinctive character which reflected very closely the geographical conditions of its setting. In shipping, as in population and in industry, it grew with marked rapidity between *c.* 1750 and the early decades of the nineteenth century. The work done by its shipping contrasts with that of ports like Newcastle and Hull, in that it bore but little relation to its hinterland. It will presently be shown how isolated Whitby was landwards before roads were improved and railways built, and it will be recalled how unproductive and scantily populated was its surrounding country. The port, in order to develop, had essentially to look seawards for its economic opportunities. In consequence, it tended to specialize in transport service. Whitby ships carried stores in wartime, and coal from the northern ports in times of peace; while they engaged in coastwise trading and even carried emigrants to the St. Lawrence in the twenties and thirties of the last century. The port, as has been explained, fulfilled a useful function as a port of refuge: it claimed in 1696 to have accommodation for "500 sail of ships," and from 50 to 100 vessels were known to have entered Whitby on one tide.[4] The town developed industries which might benefit from the custom that bad weather blew into the port and from the fact that between December 20 and March 1

[1]It was stated in 1846 that as many as six hundred vessels had been known to pass Whitby in one day (Parliamentary Papers, XVIII, pt. I (1846), Second Report of the Commissioners on Tidal Harbours).

[2]There are records of tolls charged for the use of the fourteenth-century bridge, but they are for passage *over* the bridge (Gaskin, *op. cit.*, p. 348).

[3]Photographs of this and the preceding bridge are given in Weatherill, *op. cit.*, p. 14.

[4]Parliamentary Papers, XVIII, pt. I (1846), Second Report of the Commissioners on Tidal Harbours. Nearly 1000 ships, of which two-thirds were "light," entered Whitby annually between 1811 and 1816; about 700 entered in 1849, but with the increase of iron and steel steamships the number decreased.

coasting and Baltic vessels normally lay up in the harbour. Timber, flax, hemp, and naval stores generally were imported from the Baltic either directly or *via* Hull, and rope making, leather tanning, and the weaving of canvas, sackcloth (for the coal ports), and sail-cloth were busily carried on. In shipbuilding, especially for London and for the coal trade, Whitby won for itself a good market and a high reputation. Defoe in 1724 remarks on the success and vigour of this industry. Further, fishing formed a staple though intermittent occupation, and in whaling Whitby took an active part. Thus the activity and importance of Whitby as a port would be inaccurately measured in terms of the commerce carried from, and brought into, its hinterland. It is true that there was a small export trade, mainly coastwise, to Newcastle, Stockton, Hull, and London: butter, hams, flour from Ruswarp mill, alum manufactured locally, leather, oil, fish, and canvas, and later, with the construction of the railway to Pickering, stone and iron. But landward economic relations were only one element in the port's prosperity. A few ships traded with northern Europe, the Mediterranean, the U.S.A., and even the Far East. One or two ships brought heavy timber from the St. Lawrence, which they usually discharged in Whitby Road. Even so, the characteristic feature of the port's business lay in its coastal service.

Of the exports of Whitby, apart from the manufactures of the town, mineral products were the most important. The local production of alum formed an active industry intermittently during the seventeenth and eighteenth centuries. This industry was introduced into Yorkshire about the year 1590, the first works being opened at Belman Bank, near Guisborough; but it may be noted that it can be dated prior to 1590 in other parts of England.[1] Alum works were set up on cliff sides, valley slopes, and escarpments, where beds of alum shale in the Upper Lias series were exposed: at Staithes, Sandsend, Mulgrave, Saltwick, Peak, Little Beck, Goathland, and Sleights. The industry was most prosperous about 1770, and its development was a most important factor in the growth of Whitby as a port during the seventeenth and eighteenth centuries, since not only was alum shipped coastwise to London and abroad, but its preparation made necessary the importation into Whitby or its "member" creeks of both coal and lime. The building of coal ships, coasters, whalers, and fishing boats provided a valuable export during these centuries. Baltic and American timber was imported to supplement local oak timber; there was a long tradition of ship and boat building, so that craftsmen were not wanting; and the Tyne and Wear ports formed a good local market. Wooler's plan of the town in 1740 shows shipbuilding yards near the mouth of Bagdale Beck, and repairing docks near the mouth of Spital Beck. The ambitious scale of Whitby's shipbuilding is instanced by the fact that in 1745–6 legal permission was sought and granted to chip away 1½ inches from each of the "jewells" or supports of the bridge, so that a new ship might be brought through.[2] Charlton's plan, made in 1778, shows many docks and yards. During the twelve years 1820–32, 144 ships were built, and despite a temporary depression in the industry, there were still in 1846 fourteen building slips and seven repairing

[1] Cp. Gaskin, *op. cit.*, pp. 217–224, who brings evidence to refute the view that the industry began in Yorkshire.

[2] North Riding Record Series, VIII, 252–253.

yards. The industry suffered however from the competition of cheaper, and perhaps inferior, ships made on the Tees, and from the change to iron and steel ships. The last sea-going sailing vessel was made at Whitby in 1871, but the momentum of a traditional industry sufficed to encourage one firm, at the Whitehall Yard, to build no fewer than 116 iron and steel ships, of from 800 to 6000 tons, between 1871 and 1902. That a steamship of 5700 tons, the *Theodor Wille*, was made there in 1901, and brought through the then existing bridge, would be scarcely credible, but for a photographic record of the fact.[1]

In the hunting of the right whale in the seas of Greenland Whitby played an important part between 1753 and 1837, state bounties having revived in the eighteenth century an occupation which had fallen into foreign hands. Whitby's best year in the "Greenland trade," so-called, was 1814; it sent as many as twenty ships in 1788; but after 1830 the industry practically lapsed owing to the increasing scarcity of the whale in northern waters. The whale blubber brought back to port was reduced to oil at oil houses on the river side above the town, of which there were four in 1817. The refuse after the extraction of the oil, known as "fenks," was used as a manure. Jaw bones of whales were used to form gates, and one may still be seen just outside Sleights, on the road from Ruswarp. Whalebone, an additional product, was adapted to numerous purposes where flexibility was required. Fishing in the ordinary sense, together with the salting of fish, was also carried on, and pannier men in summer carried fresh fish as far inland as York, Malton, and even Leeds. Fishing seems to have declined at the beginning of the nineteenth century at Whitby, as it did at Hull: the explanation seems to be that fishermen transferred their energies to the coastwise trade and to the more lucrative, though more hazardous, enterprise of whaling. In 1833, in anticipation of railway construction, a new Herring Company was started at the port.

Finally, one more industry of Whitby, that of jet cutting and polishing, should be mentioned, since, between 1850 and 1875, it became easily the most important occupation of the town, at a time when the alum industry and whaling had ended. It is estimated that as many as 1500 jet workers were employed at Whitby in 1873; by 1901 the numbers had fallen to 174. Jet was very anciently associated with Whitby and was obtained in isolated lumps from cliff-side workings in the Upper Lias to the east and west of the town, from Runswick Bay to the Peak. The industry of jet cutting and polishing still survives, but after the boom years noted above it dwindled before changes in fashion and foreign competition.

Hitherto the seaward relations of Whitby have been emphasized, and there is no doubt that, except during winter storms, sea routes formed the best means of communication with Whitby both for passengers and for goods from the earliest times until the late eighteenth and nineteenth centuries, for only then did road improvements and railways ease movement by land. The roads from Whitby—to Guisborough, to Scarborough, to Pickering, and to Kirkby Moorside—were undoubtedly old in origin. In some cases they would seem to be the survivals or modern representatives of prehistoric trackways; in other cases they have clearly grown up to connect settlements of Anglo-Saxon or Scandinavian foundation. John Ogilby's road "strip" maps, published in

[1] Weatherill, *op. cit.*, p. 445.

his 'Britannia' in 1675, provide the first cartographical record of these roads, although he gives no evidence of their condition, which is known to have been very inadequate down to the mid-eighteenth century. Ogilby records only two roads: one which left Whitby by Flowergate, reached Guisborough *via* Lythe, and ferried across the Tees at Stockton[1]; and another which also left the town by Flowergate, *en route* for York by way of Ruswarp, Pickering, and Malton. Bowen's map of Yorkshire, published in 1750, shows a minor road

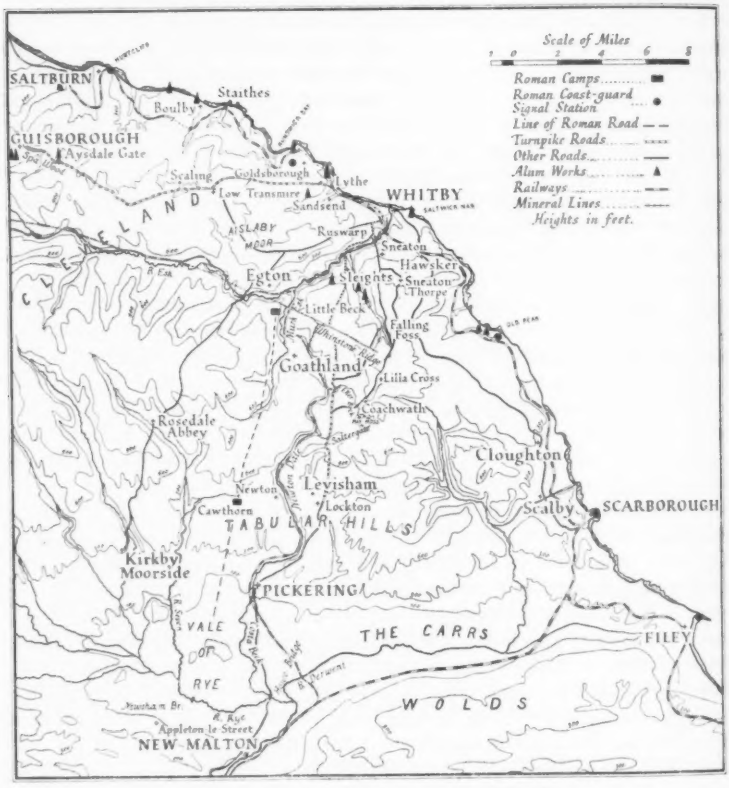


Fig. 3. Road and Rail routes to Whitby

to Scarborough, *via* Hawsker, Thorpe, and Cloughton, which struck across the cliffs from Whitby Abbey; and there was also a minor road to Kirkby Moorside, by way of Rosedale, which crossed the Esk at Egton, where a bridge is marked on Saxton's County Map in 1577.

There are now two routes from Whitby to Guisborough, both of which originally left the town by way of Flowergate. The first runs close to the coast

[1] A stone bridge was built at Stockton in 1769.

via Sandsend and Lythe, the second crosses Aislaby Moor to the south; they meet on the top of the moor and continue to Guisborough (Fig. 3). The road across Aislaby Moor, now the more important of the two, is shown on eighteenth-century maps as a mere track, and it is the road by Sandsend and Lythe which is recorded by Ogilby as the seventeenth-century road, and which was later turnpiked. The course of the road between Whitby and Sandsend has changed in one respect. The present road into Sandsend runs along the edge of the cliff and crosses two parallel streams deeply trenched into the boulder clay, after which it ascends steeply to Lythe and the moor. The earlier road, as is shown by Ogilby, and even by Cross's map, made in 1843, left the cliff at Upgang and ran into Sandsend along the sandy foreshore at low tide, thus avoiding the crossing of East Row Beck. Between Low Transmire and Guisborough the present road follows the seventeenth-century route. At Aysdale Gate it descends very sharply from the moor into a boulder-clay vale, but the present road has eased the gradient by substituting two hair-pin bends for the seventeenth-century "open V" section. The road then passes through a well-defined river-gap which breaches the Upper Lias escarpment at Spa Wood, before it reaches the broad "bay," floored with boulder clay and gravels, in which the old priory and market town of Guisborough stands.

The moorland road between Whitby and Pickering has a twofold geographical interest. It illustrates how at all historical periods, and even in prehistoric times, the need has arisen, though for different purposes, for a route across this moorland plateau. It shows, too, the way in which the course of a road may change at different times.

The many ridges running north–south up to the main Esk–Derwent watershed on the moors bear tracks which, as the presence of numerous tumuli would suggest, may be prehistoric in age, in which case they may have served to connect up settlements north and south of the Esk with settlements on the chalk Wolds of Yorkshire. In Roman times, in contrast, there is no evidence of Romanized settlements on the moor to the north of the settled fringes of the Vale of Rye. Actually the Roman road across the moor was military in purpose. It was constructed to connect the fortress of York with the Lower Esk and the Yorkshire coast, and should be envisaged as one link in the frontier system by which civilized and settled Britain to the south was defended. This road must have crossed the Vale of Rye to the west of the fort at Malton and to the west of the later site of Pickering; it then passed over the moors to the west of Newton Dale and the Murk Esk valley, and connected up four camps at Cawthorne with a camp which overlooked the junction of the Murk Esk and Esk, and guarded the river crossing from its position on the valley side south of Grosmont (Fig. 3). The road crossed the Esk either at, or a little above, Grosmont by a ford. Its ultimate destination on the coast is uncertain: it may have ended at Whitby, although there is as yet no certain evidence for a Roman Whitby. A small signal station was built on the coast at Goldsborough, c. A.D. 350, one of a series built in order to give warning along the Yorkshire coast and inland of Anglo-Saxon pirates and raiders, and this was doubtless connected with the already existing road.

In contrast to the Roman road, the seventeenth-century road and the later

turnpiked variant on this originated in the need to connect up civil settlements which had been established by Anglo-Saxon or Scandinavian immigrants, notably Pickering, the centre of a wide forest "honour," and Whitby, port and abbey town. It is worth noting the way in which the turnpike road made *c.* 1760 differed from the seventeenth-century route as defined by Ogilby and eighteenth-century maps, since the changes thus made in the Esk crossings and in the approach to Whitby effectively illustrate the operation of certain geographical factors.

The seventeenth-century road, in crossing the Vale of Rye, bridged the Costa Beck at Howe Bridge, whereas the Roman road crossed the River Rye at or near Newsham Bridge, a little to the west (Fig. 3). It then ran to the east of Newton Dale and the Murk Esk valley. Northwards from Pickering it climbed transversely over what was formerly part of Pickering forest, namely, the limestones and sandstones of the so-called "Tabular Hills," past Lockton to Saltergate, a tiny hamlet on the northern edge of the forest, first heard of *c.* A.D. 1300. Beyond Saltergate it crossed a narrow belt of Oxford clay, and then climbed on to Oolitic sandstone rocks, which, with stretches of peat bog and almost continuous heather growth, form the typical moor. Between Saltergate and Sneaton there were two frequented pre-turnpike routes: the one outlined in Ogilby's strip map, and the other described in a Quarter Sessions Order of 1749. According to Ogilby it would seem that a road crossed the Eller Beck near its source at Coachwath (wath = ford); the other road crossed the river lower down at Eller Beck bridge, which is known to have existed, although in a state of disrepair, at the end of the seventeenth century.[1] In both cases the road struck across the high moor to reach Sneaton from the south, keeping to the high, better drained land, and to the easier gradients and river crossings. From Sneaton the road descended to cross the Esk at Ruswarp, where a bridge is shown on Saxton's map. Thence Whitby could be reached by boat on the ebb tide. The road from Ruswarp to Whitby, which Ogilby aptly describes as "an Irregular way," climbed a spur which runs due northwards from the river, and then, after making three right-angled bends, crossed the little Bagdale Beck and entered the town.

The course of this part of the road was directly determined by the character of the Esk valley between Ruswarp and Whitby. Ruswarp itself stands at a narrowing of the valley where the river has cut its way through the Lower Oolite rocks, and has high, firm ground on both sides of the river, while immediately below it the flood plain of the Esk broadens out in Larpool Flat or the so-called Fitts,[2] and the river made a long loop to the north of its present channel, which was excavated in 1833, when the railway was constructed[3] (Fig. 4). It was natural that this alluvial, floodable grassland should be avoided by the road, the more so when it is recalled that between Larpool Flat and Whitby the Esk debouches through a bottle-neck which offers no

[1] North Riding Record Series, VI, 226; VII, 53, 250; VIII, 291.

[2] The place-names Ruswarp, Larpool, and Fitts are all Old Norse in origin and reflect the geographical character of the flood plain (A. H. Smith, *op. cit.*).

[3] W. W. Tomlinson, 'The North Eastern Railway' (1914), p. 269. The diversion of the river into a new channel at Larpool Flat avoided the necessity of building a railway drawbridge, since there were timber and shipbuilding yards at Ruswarp and the river was navigated below it.

natural emplacement for a road whatever: only the railway, by cutting out for itself a road on the western face of the valley, has forged a way through.

Travel by these moorland roads, which offered routes for riding rather than for vehicles, involved difficulties and dangers. The traveller was liable to find himself beset by robbers, by peat bog (May Moss was particularly feared), or by mists, while in winter snow covered the road. At all times the road was difficult to find and to keep, so that guides were necessary. Old Norse or mediaeval crosses and prehistoric barrows or "howes" helped to serve as

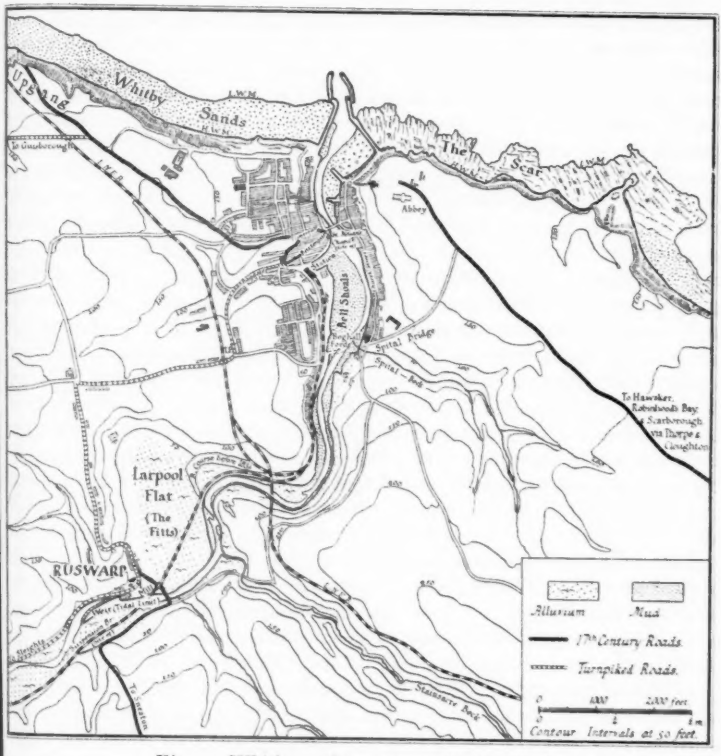


Fig. 4. Whitby and its approaches by land

landmarks, while in 1749 the County magistrates ordered guide-posts to be erected between Pickering and Whitby. Incidentally, the place-name Salter-gate (= salter road) hints at a mediaeval salt trade across the moors, and it is known that salt, in connection with the herring fishery, was imported at Whitby.

The improvements made under Turnpike Acts provided a serviceable coach road between Whitby and Pickering, and in consequence a twice-weekly diligence service to York began in 1788, and a thrice-weekly mail coach service

in 1795. The turnpiked road ran due north from Lockton *via* Saltergate to Sleights, below which it crossed the Esk to Briggswath (= bridge ford). Between Briggswath and Ruswarp a then existing road running along the flood-plain of the river was re-conditioned. This road—one of the few instances of an Esk-side road—must, from its low, floodable position, and in view of the extreme violence of Esk floods, have been frequently impassable. In the year 1708[1] the inhabitants of Ruswarp were indicted for not repairing this "highway," which had become too narrow because of Esk floods, and it is significant that although this road was then referred to as a highway between the market towns of Whitby and Kirkby Moorside, the road shown on eighteenth-century maps connecting these towns is one which runs high up on the northern side of the valley to Egton, below which it bridged the Esk and continued to Kirkby by way of Rosedale (Fig. 3). The difficulty of passage by the flood plain road may explain why the early road from Pickering to Whitby crossed the Esk at Ruswarp rather than at Sleights, despite the fact that the latter had a stone "bow" bridge as early as the thirteenth century.[2] Even so, there were marketing relations between Sleights and Whitby, but traffic must have been forced up by the hill road when the flood-plain road was out of condition.

Road improvements from the latter part of the eighteenth century onwards gave Whitby for the first time effective landward communications, and must have stimulated in some degree its activity as a market town. It is significant, for example, that a writer in 1808 states that Egton had given up its weekly market since there existed then a good road into the market at Whitby. A further effort to provide for the port a hinterland, the lack of which constituted its greatest drawback, was made by the construction of a railway to Pickering in 1836. In the early 1830's the industries of the port were depressed: the alum industry around the town had largely disappeared, since that product could then be made more economically on the coalfields from carboniferous shales; shipbuilding and whaling were declining, while the large-scale jet industry had not yet developed. In emulation of the northern coal ports Whitby conceived the project of a railway up Eskdale to connect with the Stockton and Darlington railway, and thus to become an outlet for Durham coal. George Stephenson showed, in 1832, that this scheme was uneconomic: the necessary gradients at Kildale would entail high freight rates, and it would be cheaper to move coal by rail to Middlesbrough and thence to Whitby by sea. Accordingly, the less ambitious line to Pickering was undertaken.[3] The geographical interest of this railway is that for the first time a link was forged between Whitby and Pickering by way of the Esk and the rocky wooded gorges of the Murk Esk and Newton Dale, which hitherto had been avoided equally by settlements and by roads. This single-track railway, over which horse-drawn coaches ran until 1846–7, when it was reconditioned for steam locomotives, involved certain engineering difficulties owing to the nature of

[1] North Riding Record Series, VII, 212–213.

[2] Bridges at Sleights were continually destroyed by the very violent Esk floods, *e.g.* in 1930 and 1725 (North Riding Record Series, VIII, 172).

[3] In 1793 a canal project to link up Whitby and Pickering was considered (Young, 'History of Whitby' (1817), ii, 802).

the country. It has already been noted that the railway had to cut a way for itself in the river cliff above Whitby, and that the Esk was diverted at Larpool Flat; some ten wooden bridges were necessary across the meandering Esk between Whitby and Grosmont, and a short tunnel to bring the line into the Murk Esk valley; piles to support the rail had to be driven into the peat on the main Esk–Derwent watershed at Fen Bog; whilst self-acting inclined planes had to be constructed there to overcome the steepness of the gradient. Economically, the railway served to carry, besides passengers, coal and general commodities imported into Whitby from Newcastle, Hull, and London, and to bring back to the port many mineral products. Building stone was brought from quarries at Pickering and at Leaserigg, from which a side line gave access to the railway. The whinstone ridge, which crosses the Esk obliquely and continues north-west—south-eastwards across the moor as a minor topographic feature, was quarried for road-metal at Goathland, where the quarries were connected by a tramway with the railway at Goathland station. Ironstone also was increasingly mined at valley side workings in the Lower Lias below Goathland, at Grosmont, and between Sleights and Ruswarp. The building stone and road metal went mainly to London, and the ironstone was shipped to the blast furnaces on the Tees estuary in small coasters which called in at Whitby *en route* for the north. Further, lime kilns, using Pickering limestone, were set up at Grosmont. Even so, when the line was reconditioned the Yorkshire and North Midland Railway Company sought to increase its traffic by attracting tourists to Whitby, and to this end they initiated road and building schemes on the hitherto unoccupied West Cliff, below which lay, in contrast to the Scars below East Cliff, a sandy foreshore (cp. Fig. 2). The railway was eventually extended to Stockton from Grosmont, by Kildale, in 1865; Whitby was linked with Skinningrove in 1883, and with Scarborough in 1885: the late date of these last two railways is explained by economic reasons. The difficult relief of the country made construction very expensive, and its scanty population and natural resources promised no adequate return on a big capital outlay.

In the last half-century Whitby has striven to adapt itself to the service of a tourist traffic which reaches it by railway and by road. It has now, relatively to its past, turned its back upon the open sea. Its present economy illustrates one of the several changes in geographical values which the site of Whitby has undergone. The Abbey—it was dissolved in 1539—has long ceased to be the stimulating factor in the life of the town, whilst the harbour, in these days of big steamships and giant ports, has lost its former function as a haven of refuge. In the amenities of its sands, cliffs, and moors to the visitor Whitby has still a natural endowment to exploit, but an assessment of this endowment, and in particular an assessment of its degree of permanence, lies within the scope of aesthetic rather than historical geography.

THE BRONZES OF LURISTAN

FREYA STARK

SO little is known about the bronzes of Luristan, and their interest to the archaeologist and historian is so great, that any one who has had the good fortune to enter at all into that little-known country is justified in recounting his experiences. I was able to travel last October from Nihavand over the Varazan pass to Khava, thence to Alishtar, back again through Khava into Dilfan, and from Dilfan by Chavari through Duliskan to Tudaru, which seems to be at present the southern limit for the police of the district; thence I went south half a day's ride along the Gizarud and up a little valley, hitherto unnamed on the maps, which I discovered to be that of the Kangaveri river, leading to Sari Kashti, the northern centre for the Luristan bronzes, in a landscape full of ancient looted cemeteries. I had no opportunity to see more than one grave actually being opened, and I am no expert to develop theories about them, but it may be useful to put down all I could notice or discover, and leave it to minds better equipped to draw conclusions. I have written elsewhere the account of the actual travelling and its adventures, and will confine myself to what concerns the graves and their possible history. Special interest has been centred on those graves which are said to contain the trappings of horses and chariots, for the origins of the people who used such things may throw light on the coming of the horse into Persia. When the bronzes first appeared on the market, carried by tribesmen over the Luristan passes to Kermanshah or to Harsin, it was thought that the plains of Alishtar and Khava would be the home of this horse-breeding nation; for these plains were supposed, after Sir H. Rawlinson marched across and saw them in 1836, to be the Nisaian pasture lands of the Achaemenian kings. But though the two plains are sprinkled with old mounds and cemeteries, I could find nothing there belonging to a horse, nor had any grave with a horse's skeleton inside it been found there. There is a mound by a village called Qal'a Kafrash in Khava where I found a shard of early Islamic painted ware, a carved arabesque on pale green background. There is another mound at Beira, also in Khava, where a bronze dagger had been found. In the south of Khava there are graveyards round the great mound of Cheha Husein, and the people told me that bronzes had been found there; nothing however of the more elaborate kind of Luristan work with carved masks and animals, and nothing in the way of harness.

In Alishtar it was the same. The site of the ancient city of Alishtar is full of gravestones of a peculiar kind, about 5 feet by 2 feet, with a scroll of ornament or Arabic script running round them, and a carved knob at each corner; near them on the ground one may pick up fragments of Islamic glazed ware; and one comes upon these tombstones elsewhere in Alishtar, at the old village of Deh Ram for instance. There is the tradition that, on the site of the ruined city, an old minaret still existed a few years ago when the Government troops, who were destroying the power of Mir Ali Khan, razed it to the ground as a possible stronghold for rebels: from the descriptions I was able to obtain this minaret must have been something like that of Saveh, a plain tubular shape covered with ornamented brickwork: the bricks are still lying about; the site seems to

have been that of a large cemetery, and all points to a flourishing Islamic community continuing well into the fourteenth century, when Mustawfi does in fact mention Alishtar as an important town in Kurdistan. The local legends are also Islamic, and go back perhaps to the time of the Moslem conquest. They say that the three chief cities of the Unbelievers were the mounds of Gian (where Dr. Contenau is now digging near Nihavand), Qal'a Kafrash in Khava, and Geraran in the north-east corner of Alishtar: here are their buried treasures. The legends of Khava further relate that Hazrat-i-Amir 'Ali stood on the hill of Kurrakamendar on the southern edge of Khava, and thence with one stroke of his sword destroyed the capital of the Unbelievers at Qal'a Kafrash, and would have gone on to destroy the whole race of mankind if the angel Gabriel had not held his arm. All this points to Islamic times and links the two plains with the general history of Moslem Persia, and there is further the tradition of an old causeway over the Gatchkah pass and Kuh Garu, to join Alishtar and Khava to Nihavand and the north. I found a few older objects among the Islamic in Alishtar: some glass beads, silver earrings of the usual Luristan type, and a bronze arrow-head; but could not ascertain the exact spot where they had been found.

As soon as one leaves the eastern and northern sides of the plains, where the settled villages now are and probably have been for a very long time, and especially as one comes south of Khava into Dilfan, the traces of much earlier settlements become more and more frequent; though even here I came upon no sign of the horse trappings I was seeking. The first prehistoric objects I found were five stones like rough cubes, about 2 or 3 inches on every side, so rough indeed that I was in doubt whether they might not be natural shapes until a few days later they brought me one obviously worn and shaped by human agency, found in a grave. These stones were placed as votive offerings in a little enclosure surrounded by a low wall of heaped boulders at the foot of the Gatchkah pass. The place is called Dukkan Daud, the Shop of David; and I learnt nothing about it except that it had been a holy place for a very long time. I next went into Dilfan and spent two days with the Nurali Lurs there in the valley of Gatchenah, also hitherto unnamed on the maps. It must have been inhabited for a long period, for in the lower part one comes upon bits of glazed Islamic ware and mounds that seem to be the remains of buildings; and as one rides further, one finds the place lined on either side with what look like old buried habitations and with cemeteries. The rifling of these has been going on to such an extent that it is now difficult to discover an unopened grave quickly, and the tribesmen searched about for me all day in vain. As I waited, I spent my time in getting information from as many different people as I could, and was told that three, and possibly four, separate kinds of grave have been opened in this valley.

The first are rectangular ones of the kind I was to find next morning, in which the skeleton lies on its side with its knees crouched up, and where, they told me, no objects except pottery and flints are found. These graves are lined with rough upright stones and covered with flat slabs, very roughly shaped, a method of roofing common to all the tombs in this district. The men told me that the skeletons are always oriented with their heads to the south. The second kind of grave is like the above in shape, except that the skeleton's head

is laid towards the east; the knees are likewise bent to one side. Bronzes and flints are here found together, and especially flint knives about 10 inches long, which are never found in the former type of grave. The bronzes appear to be very varied. The spear-head lies on the breast of the buried man, the axe-heads under his neck or at his side, the weapons near his right hand: earthenware pots below his feet or above his head. His idols, when there are any, are placed close to his breast on the left side. And the ornaments of the women, bracelets, anklets, bronze belts, torques, etc., are all found in their usual places on the skeleton. The third kind of grave is round, about 3 feet in diameter, also lined with rough stones and covered with slabs, and the skeletons appear to have been put in in a sitting posture. Bronzes are found here and possibly flints, but I could get no very unanimous information on this point. These graves are very numerous, scattered, opened and empty, all over the district. The fourth is an interesting sort of grave which properly belongs to the Tarhan country farther south; the people call them Lihaq, and they are long and narrow, the length of three horses, one man said, probably exaggerating. They contain very numerous skeletons, and they are roofed with flat slabs put on end like a penthouse. In the south, near Tarhan, their sides are sometimes properly walled and finished on the inside with plaster, and skeletons of horses are said to be found among the human bones; but nothing of this sort had ever been seen in Dilfan. One of my hosts told me he could show me some of these Lihaqs about 4 miles away, and we rode off confidently only to find that, whatever there may have been, the stones had now been carried off and nothing but a number of shapeless holes remained; and, if it had not been for the man's confidence, and the fact that he had seen them himself and led me without hesitation to the exact spot, I should have doubted the existence of Lihaqs so far north, for I heard no further report of them till I reached Sari Kashti. All these statements I give for what they are worth as tribesmen's evidence, though I was always careful to get the corroboration of several people, and to question them separately.

Meanwhile I was unable to get any of the flint knives: they had all been thrown away as valueless. I got a good many bronzes, of the simple Luristan type. Unless one actually sees it dug up, it is very difficult to be sure exactly where an object comes from; more than half the things I saw in Dilfan had been dug up in the "Garmsir" of Tarhan or Kuh-i-Dasht; the tribes move south every autumn and back again in spring, and carry all their possessions with them. I was not able to buy much owing to the danger of appearing to have money in this insecure country; but I handled a great number, and found out where they came from as far as I could, and got an impression that the simple and ruder things come from the rectangular graves, while the really elaborate work comes from the southern country. This however is only a personal impression.

Next morning the tribesmen scattered again in little groups over the lower slopes of the hills. The system of treasure hunting is now thoroughly elaborated and has evidently come from much practice. Men go out with stout skewers about a yard long which they dig into the ground at intervals: if they hit a flat surface about 2 feet underground, they try again close by in suitable places and if the surface appears to continue in the shape of a presumable grave, the

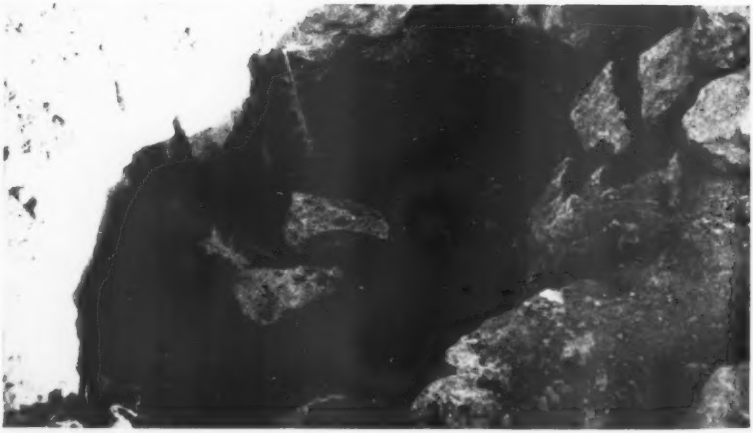
Kangaveri valley, looking east

Dilfan: searching for graves with a skewer

Mound of Qal'a Kafrash

Graveyard at Dilfan

Long grave at Dilfan



Circular looted grave at Dilfan

gather hopefully to dig. Towards the end of the morning shouts of triumph and several small Lurs cantering down the hill announced a find. I arrived just in time to prevent the skeleton from being hacked to pieces in an excess of zeal. It was a poor grave, of the simplest kind, lying below a cornfield whose shallow ploughing had not disturbed it, though the stones, if there ever were any, had been pulled up. The skeleton lay with its head pointing south, its knees gathered up towards the west, and its feet to the north. Two little flints were under its head, and a few shards of very coarse earthenware at its back. It was a meagre find. Another object, which had been discovered close by in the same sort of grave a short while before was now brought me; it was a large pot of greyish earthenware with a dark brown flame-like design, unglazed, rising towards the neck from horizontal bands of the same colour. It was an exact replica of the rougher kind of ware now being excavated at Gian-Nihavand. Small broken pots had been found inside it. I bought it, and also brought away an unglazed bowl tinted with pinkish earth colour: another pot of very heavy earthenware, square, with a round top, of which I had also seen many at Nihavand, was offered me but had to be left. Even a small amount of luggage is a real danger in this part of Luristan. The police have built a road which they patrol with a series of small guard towers, though no car has yet ventured along it; south of the road they do not venture except in force. I had only the protection of one Lur guide and a very terrified Persian muleteer, and this insecurity made the acquisition of every new object a matter for serious thought. Such as it was, the day's digging was now over; I had indeed had great difficulty in getting as much done as I did, since the Government are making a real effort to stop the looting of these graves and have visited many of the tribal chiefs with fines; the result is that they now only open the graves when no one is about.

They gave me a wild but handsome guide known to the next tribe—an absolutely essential requisite in this country—and we rode along the western edge of Khava, over rolling downs covered with small holes where gum tragacanth is gathered, to Chavari, where there are many Ali Ilahis credited with the power of eating fire, possibly remnants of the old fire worshippers of Qal'a Kafrash. Thence from Deh Kabud, the chief village of the plain, we went to Duliskan, which is the most northern settlement of the Ittivend Lurs. Every one who seemed to know about it was unanimous in saying that all the best bronzes, and the horse skeletons, are found in the country of the Ittivends, which is unfortunate, since this tribe has a particularly bad reputation. The commercial centre, to which Jewish merchants have a precarious access by paying blackmail in the form of ammunition to the bandits who hold the passes, is south-west of Khava at Sari Kashti, in a lonely valley not, I think, hitherto visited by Europeans. I was told however that I might possibly also find something as far north as Duliskan. In this I was disappointed. The graves of Duliskan appeared to be identical with those of Dilfan; and there was nothing to do with a horse among the one hundred or so bits of bronze brought for my inspection. We therefore decided to risk Sari Kashti, and began by travelling south to Tudaru or Tuyaru, which is a little tongue of Kakavend inserting itself into the Ittivend country, and is the most southern bit of land in this region to come at all under police control. Here I heard of circular graves with the skeleton inside them enclosed in a jar. As usual, I could not see one for

myself, but they showed me one of the jars at Tarazak near by. It was 21 inches in height, 18 inches in diameter, with an opening of 9 inches made of rough reddish earthenware with four little holes near the top to pass a cord through. It had been found standing upright, with two skulls inside it, the opening closed by another smaller jar coated with green glaze. They told me that many of these jars are found not upright but lying on their side.

I now began to feel more hopeful, for circular graves with horses *had* been found in this neighbourhood. The real country for them however, they all repeated unanimously, was farther south. We left the safety of Tudaru and rode through the defile of Tang Cherash down the Gizarud and up the Kangaveri stream to Sari Kashti, finding looted cemeteries on the low foothills of the valleys near water, which always seems to have been the favourite location. This is a spacious country with cultivation here and there but no houses other than the black nomad tents. One rides at one's own risk. Sari Kashti, like Duliskan, Dilfan, Tudaru, Tarazak, and indeed all the names here, refer only to regions with rather vague boundaries, and not to places in our sense of the word. Sari Kashti is really the northern side of a big hill called Bala Buzurg, a grazing ground for the Ittivend in summer; their tents were scattered here in small colonies. I had only a day's leave in this dangerous district, as it was not safe for the police to escort me and they were very reluctant to let me go at all. As the authorities had been more than kind all through, I felt I could not overstay their permission more than one day at most. This made my chance of finding an unopened grave almost nil, and in fact I had realized for some time that a successful expedition into this part of Luristan would need planning in quite a different way from my own preparations, which had been intended only for Alishtar and Khava. I was further unlucky in not finding the head of the Sari Kashti Ittivends at home, and though the tribesmen were finally induced to stick their skewers here and there into the hillside, and we spent one hopeful hour digging up two boulders, by the time evening came I knew that I must give up all hope of actually seeing what I had come to see.

I heard more about the Lihaq graves, though the Ittivends corroborated the Dilfan tribesmen and told me that their real centre is farther south; those that are found here are covered over with flat-lying slabs and not with the penthouse slabs characteristic of Tarhan. The horse is sometimes discovered inside them, but most usually is found in the round graves either quite alone or beside the man with its head by his right hand. Arrow-heads are occasionally wedged in the bones, apparently stuck at random and not aimed at any one particular place. The horse, they told me, is shod with a solid bronze plate curved so as to catch in the hoof at the back and fastened in front with one screw. That the screw was known to these bronze workers would appear from an object brought me from the Kuh-i-Dasht, a hollow tube like the stick of a candlestick evidently meant to screw on to some stand.

Among the objects which I saw were numbers of cornelian beads and green glass beads, bronze pendants, pomegranates, animal heads, the model of a small jug in bronze, anklets, bracelets, daggers and axes, torques, bowls, bodkins, maceheads, a silver earring of the shape of the Sumerian earrings in the Baghdad Museum, bronze buttons, late cornelian seals (? Sassanian), many beads that appeared to be Parthian or Sassanian, and, of uncertain locality,

some bronze beads threaded on to a bracelet; everywhere there were numbers of shell ornaments. From Kuh-i-Dasht there came a bronze funnel-shaped strainer with a handle, and an alabaster bowl; from Gizarud a bronze spoon with a twisted handle, and an Achaemenian cylinder seal, the latter possibly carried up from the south; from Tarazak a very rough bronze plate; and from Duliskan a bronze spear-head with a hole for a rivet. The finds at Sari Kashti were especially interesting; there was a very beautiful bull's head in bronze, and a little headless bronze figure, undoubtedly of Greek origin or influence; I would have liked to buy the latter, as the only Hellenistic specimen I had seen, but they asked more for it than I dared give. Had I known then however that no Hellenistic object has yet been known to come from Luristan and the historic interest of such a find among these Kassite remains, I would have risked a good deal more to get it. Most of these objects belong to well-known types of these bronzes; the last four are, I think, new.

The valley of the Kangaveri is lined with whitish and pink flinty rock. This may have been one of the causes which made it a centre in prehistoric times. The people told me that flints are found in nearly all the graves. They repeated what I had heard in Dilfan, namely that the small flints are found in the graves where there is only pottery, and the long flint knives together with the bronzes; but I was unable to collect any specimens, nor did the people know of any copper in the country. We were in some danger during all our stay among the Ittivends, and I felt so certain of being robbed if I admitted to having money about me that I was glad to get safely away with what I had been able to collect and await a better opportunity for attempting anything further. I had a Kakavend guide who was completely fearless, but found a blood feud waiting for him whenever he stepped beyond the boundary of his tribe. He and my Persian sat turn and turn about at the opening of the tent through the night, guarding ourselves and our horses from our hosts, with the Kangaveri valley flooded in moonlight and scattered with camp fires far below. Next day we rode back up the Gizarud to Tarazak, and came down upon Harsin and motor cars and civilization over a rolling dry country with gentle passes, Daramru, Gahmasir, and Kuh-i-Daud, all belonging to the Kakavend. These valleys, the Gizarud and Kangaveri and all their neighbourhood, are now bare downs; fifty years ago however they were covered with jungle scrub and used to be forest; the charcoal trade is destroying the woods of Luristan at a great rate. It is a surprising thing that the traces of horses are found more, according to the reports, along this wooded strip of the Saidmarreh and its tributaries than in the wide open plain of Alishtar and Khava, so eminently suited to them, one would think. The horse-breeding nation would seem to have travelled along the great river, either up or down.

A few observations force themselves on the notice even of the casual traveller: in the first place the great variety of objects found, so that the civilization of the Luristan Bronzes appears to cover a great many different times and fashions; secondly, the identity of the ware of Dilfan with that of Nihavand, uniting Khava with the civilization to the north of it; thirdly, the localization of the horse trappings and skeletons to the Saidmarreh region. Customs and traditions in countries which have not been revolutionized by new means of transport vary very slowly, and it is perhaps worth mentioning in this connection

that the district between Duliskan and Tarhan, where the graves with harness are found, is still considered the best for horses. These Lurs set great store by their ponies. As we rode along my man, whose mare had just been poisoned by some enemy, was condoled with by all his friends: "May it be added to your own life," they all said, as if he had lost a wife or a son. Fourthly, there is a curious similarity between the Lur type and some of the old Sumerian carvings. Examples in the Baghdad Museum might easily be taken for a modern Lur. In the old effigies, the thin slightly waved beard of the southern people is distinct from the thick curly Assyrian type, and I was struck by this same quality, a rather flat and quite slight wave in the long beards of the few old Lurs I met (they mostly seem to die young) as compared with other types in Persia. Fifthly, there are the modern carvings in Luristan, on gravestones forty or fifty years old, and well worth looking at. They are done with much spirit, in the old manner, and some of the goats and cows might belong to the very school of the craftsmen of the bronzes. The Lurs draw these, the goats especially, everywhere—on the walls in their houses, the felt rugs they sleep on, etc. On the tombstones they put all the things they care about, figures of men and women, guns, horses, and flocks; on one tombstone near Alishtar I saw, very surprisingly, an elephant. A horse is carved on practically every tombstone. When one looks at this spontaneous art and sees how little it has changed in feeling and technique, one cannot help thinking that the horse cannot have been so very common among the people of the bronzes, or its effigy would have appeared more frequently on the tombs. The fact also that it used to be buried in a grave of its own suggests that it was still a rare and treasured animal. There is an interesting field of study open to any one who will venture through the Saidmarreh jungles to the burial grounds of Tarhan.

After the appearance of Professor Godard's authoritative book on the Luristan bronzes I was in some doubt whether to publish this account of my own journey in that country. I have been induced to do so by the fact that, complete as Professor Godard's investigations were, they were carried out (as far as I can judge in the absence of any maps in his volume) in the very north-west corner of Luristan, not far from Harsin; and as my journey took me farther east and south, I thought that some useful data might be found in the gossip gleaned from tribes unvisited by Europeans since the discovery of the bronzes. The spear-head from Duliskan and the little Greek bronze figure from Sari Kashti, both described above, are new additions to the Luristan finds. I am aware that much of what I heard must be inaccurate, but I have not altered anything to bring it into line with Professor Godard's researches, thinking that, until some one visits that part of the country, it is better to transcribe the reports of the tribesmen as closely as possible.

The only thing to be regretted in Professor Godard's book is the absence of a map. When he speaks of the Dasht-e-Khave he has evidently been misled: Khava is a plain about 12 by 8 miles due south of Nihavand; far from being *sans rivière* it has a good-sized river, the Badavar, running through it which any one travelling there would hardly miss. This river flows into the Gizarud, which in its turn flows into the Saidmarreh. I was there in October before the rains, and found plenty of water. I take it therefore that Professor Godard

did not reach Khava on the east or the Gizarud on the south, but that when he stood on the rolling hills of the Kuh-i-Daud, south of Harsin, which he describes exactly, and asked his guides what the place was called, they waved their hands eastward in the vague Persian way and said, "There is Khava," though as a matter of fact the plain is nearly a day's journey farther east. The fixing of localities is indeed one of the most difficult things in nomad country with no settled villages.

Professor Minorsky has kindly sent me the following comment on the name Dukkan Daud = the Shop of David (p. 499): "There is a more celebrated place of that name south of Saripul. Both are certainly supposed to be David's workshops where he fabricated his famous coats of mail (Quran xxi, 78; xxxiv, 11). The place must certainly be connected with the Ali Ilahi cult."

[*We regret that we have not been able to reproduce for this number the sketch-map which Miss Stark made to illustrate her paper. It is however available for students in the Society's collection, and we hope that it may be reproduced in a later number to accompany a further paper by the author.*—ED. *G.J.*]

THE HABITABILITY OF CHINESE TURKISTAN

LIEUT.-COL. R. C. F. SCHOMBERG, D.S.O.

AT a period when Nature has shown herself so lavish that the world is glutted with foodstuffs, it may be almost perverse to discuss the possibilities of the empty places of the universe; but population continues to increase, and lean years follow fat ones. These empty places must therefore be a subject of speculation, and it is proposed to consider briefly to what extent the province of Sinkiang, which embraces all Central Asia now in Chinese hands, can support future generations.

Politically this province comprises three geographically distinct regions: 1. The so-called Tarim Basin between the Tien Shan and Kunlun ranges, which is at once the most populous and the oldest inhabited of the three. 2. The plain north of the Tien Shan. 3. The Altai area, between the Great Altai range and the Irtish river. The Ili valley and the Turfan depression are isolated tracts which do not call for separate discussion.

The population of the province consists of nomads and settled cultivators. It is the latter who predominate, and the means of subsistence from agriculture are greater than from pastoral pursuits; and as the Tarim Basin is the most promising part of the province, it is well to consider it first. Agriculture in the Tarim Basin or Kashgaria (a more convenient name) depends wholly on irrigation, and I have nowhere seen south of the Tien Shan, either on the plain or in the hills, a single piece of unirrigated ground under crops. The present population of Sinkiang is between 5 and 6 millions, and that south of the Tien Shan certainly well over 4 millions. Professor Penck's estimate (see *G.J.*, vol. 76, p. 484) requires revision. The estimate as now given is based

partly on observation, but chiefly as the considered opinion of the late Governor and the chief officials at Urumchi, and may be regarded as a conservative one.

To enable any clue of the capabilities of the Tarim Basin to support a larger population its irrigation must be considered, for on irrigation depends the life of the people. Unfortunately, Turki methods of irrigation are singularly bad. The season is from May to September, and during the rest of the year, when the water is low, or frozen, the fields are flooded to soften them, though even this is not the universal practice.

Sketch-map of part of Chinese Turkistan

Any one who has observed methods of irrigation in other parts of the world where water is scanty or the congestion great will be unfavourably impressed by even a casual glance at Turki irrigation. To begin with, there is no system at all. It is true that there are local functionaries in charge of the water supply, but there is no co-ordinated arrangement whatever. The original canalization is uneconomical and inadequate, and the distribution of the water is unequal and uncertain; and in addition the cultivator himself wastes his water. Thus, from the moment the supply in the river is tapped, much avoidable loss, apart from sepage, is incurred. The whole irrigation is bad from beginning to end.

The Turki farmer has a perennial grievance on the subject, but he cannot, in face of the supineness of the administration, do much himself. The problem is too great for the individual, and every distinct irrigable area requires overhauling and replanning: not an expensive task at all, but one requiring skill, enterprise, and intelligence, very rare qualities in Turkistan and especially in the yamens. For instance, in the Kashgar area there are five civil districts depending on the Kashgar river and its affluents, and the irrigation, instead of being under one authority with a consolidated system, is all parcelled out with deplorable results, the water reaching some fields in excess, others very much in defect.

Moreover the wasteful habits of the Turki cultivator call for comment. No Turki ever irrigates his fields at night, not even in places where there is a water shortage, and those who know the countries where the tenants spend the nights watering their fields as being the only means of ensuring enough irrigation, will realize then one-half to one-third of all the water runs to waste throughout the irrigable year. The swamps that accumulate round a village, and the failure to save water in tanks or *bunds*, illustrate the lackadaisical ways of the Turki. The reason of this disregard for water will be discussed later, but the point here emphasized is that in the chief settled areas of Turkistan half the canal water is wasted, so that with proper economy double the population could be supported with the existing supply.

The yield of crops in Turkistan is poor. The return for wheat is on an average of 12. At Charkhliq (Lop Nor) it is 15; at Aqsu and Uch Turfan 10 to 12; at Bai (a cold place) 8 to 10. In England the highest yield is 19·9; in Germany 18·8; in Denmark 30·4; and in parts of India, with good seed, nearly that of England and the Continent.[1] The yield of maize, barley, and rice is also very low, and the grains, particularly of maize and rice, small and ill-formed.

These indifferent harvests are due to want of fresh seed and bad husbandry. The same seed is sown year by year on the same ground. The weeding of the fields is perfunctory and slovenly, and often neglected. The rice crop is particularly badly tended, in spite of the fact that there is an unsatisfied demand for rice which is exported to all parts of the province and fetches very good prices. The seed is never sown in nurseries and then transplanted into the fields, and regularly weeded and watered, but it is flung anyhow into the fields and only weeded once.

The slovenliness of the Turki reacts on the soil in such habits as not cutting down the maize but merely taking off the heads and leaving the stalks for winter fodder for animals. Then, again, the young wheat is deliberately twice eaten down by sheep. This is said to increase the yield when the corn is finally allowed to grow, but there is loss caused by the animals trampling down the young shoots. The Turki keeps fewer domestic animals than the native of India, but he does not use all their manure for fuel, although the manure available is inadequate. Horse dung is the most abundant, and it is singular that in Sinkiang it is the most valuable, as it enriches the soil in a way unknown in other countries. The dryness of the climate and the failure to store manure

[1] The amounts for England, Germany, and Denmark are given in cwts. as the highest average yield per acre, from the Ministry of Agriculture's Official Report, 28 February 1924. The yields in Turkistan are in return to the seed sown.

properly prevents a supply of "short" or well-rotted dung. A great deal turns on the manure pit, and the introduction of this manure pit into the Gurgaon district for the Eastern Punjab (see F. L. Brayne, 'Rural Reconstruction in India: The Gurgaon Experiment') was a remarkable success. In one or two places I have seen these pits in Turkistan, but they are very rare. If the available manure were properly collected and stored, the increase in the harvest would be great, and the shortage now complained of would be largely adjusted.

The poverty of the soil is not often a factor in production, as generally speaking the soil in Turkistan varies little and is very good. Sir Aurel Stein records that the whole of the Taklamakan desert is potentially cultivable. There are, of course, throughout the settled areas sandy tracts where cultivation is poor. The usual loess soil benefits by a top dressing of sand which prevents it from setting into a cake of hard clay after irrigation; and so small heaps of sand are commonly seen on the fields before ploughing.

The Turki often over-irrigates, and although he understands the rotation of crops, is very lazy about it. Perhaps he should be described not so much as a bad farmer as an uninterested one, without that keen absorption in the land which is often a pleasing trait of the Indian peasant. The reason for this languidness in farming and the unsatisfactory system of water supply lies in the lack of incentive. Generally speaking the Turki can grow, under the present hugger-mugger agricultural system, more than enough for his personal use and for marketing, so there is no inducement to greater efforts. After all, his attitude is natural enough, and so it is that the farming standard is in all respects low. When it is realized why there is this lack of agricultural enterprise, it will be possible to estimate the agricultural possibilities of the country, for this low standard has nothing whatever to do with bad soil, defective water, or uncertain climate, but solely with the farmer himself.

It is safe to say that proper irrigation will double the yield. Good farming will add 50 per cent. to this double yield, so that the average settled areas should treble their returns. This is a conservative estimate, as the land adjoining these settled areas and not now irrigated would come under the plough by the introduction of a good system, and thus the population of the settled areas of Sinkiang could be increased to 12 millions.

Professor Penck (*op. cit.*, p. 484) gives 5000 square miles as a rough estimate of the cultivated areas of Southern Sinkiang, based on Sir Aurel Stein's maps of the Tarim Basin. But this requires some adjustment. To begin with, much cultivation is unmapped, notably the fertile district north of Aqsu. Then again, the maps are thirty years old, and allowance must be made for the increase of the areas shown, opening of new ground in areas mapped, and for cultivation both new and old on wholly unmapped tracts. It is quite safe to double this estimate. Very little land has gone out of cultivation, whilst in some cases, *e.g.* along the left of the Yarkand river from Yarkand city almost up to Maralbashi, what is shown on the map as a scantily settled tract is now a belt of fertile land with busy bazaars.

Having thus discussed the cultivated parts of the Tarim Basin we must consider how much more of this immense area is available for human settlement.

Professor Penck (*op. cit.*, p. 486) rightly discards the habitable estimate of 75 inhabitants to 1 square mile as being much too low, and would raise it to 225. This estimate approaches that given in M. L. Darling's 'Rusticus loquitur,' p. 84, where a family of five, growing wheat, maize, and sugar-cane, can be supported in comfort on 13 acres of "barani" or non-irrigated land. (It must be remembered that there is agriculturally speaking no rainfall in Southern Sinkiang.) P. 199 (*op. cit.*) gives an estimate of five persons on 9 acres if water were sufficient; except for the sugar-cane, the resemblance of the Punjab to Kashgaria makes this valuable corroborative evidence, and allowing for difference of yield and season 250 persons per square mile is admissible for Turkistan, especially as the Sart has additional food supplies in cheap meat and in the oleaster (Trebizond date), while the lack of ghi is balanced by the linseed oil he consumes.

I confess to being unable to follow Professor Penck's estimate of the amount of cultivated land along the Tarim (p. 486), as it seems to me that this vast river would lend itself to a scientific system of irrigation and that the lagoons, backwaters, swamps, and minor branches would all appropriately disappear when the water is brought under control. Take, for instance, the village of Qaratai (Stein's Map No. 25, D.4), a Loplik village in south-east Sinkiang. In former times before the water from the Tarim flowed into the Yangi Darya this village was conspicuous for its fertility, so much so that 80 lbs. of wheat sold for sixpence. The land about it is irrigable and cultivable, and the same applies throughout the course of the river from Kurla to Charkhliq. Where now exists a shortage of water, scanty crops, dying pasture, and dwindling herds, there could be made by proper canalization a smiling area. I cannot believe that proper canalization of the Tarim together with the Konche Darya is only going to increase the cultivated area by 1000 square miles, which is little more than that irrigated by the comparatively insignificant Keriya river. But perhaps I have misunderstood the figures.

Bearing in mind how the face of the Punjab has been changed by successful canalization I think it difficult to limit the habitable possibilities of Kashgaria if scientific methods accompanied a development caused by pressure of population. In the Lyallpur district of the Punjab the population rose from 30,000 in 1891 to 979,000 in 1921. There is as good soil and abundant rivers in Sinkiang as in the Punjab, but without the irregular climate and ubiquitous pests. In this dry rainless region conditions of life are far better. In the Eastern Punjab the tenant is well enough fed, not badly clothed, but miserably housed. His dwellings are rat-ridden and vermin-infested (Darling, *op. cit.*, p. 346). Contrast this with the roomy comfortable houses of even the poorer Turkis, where flies are seasonal and vermin and rats unknown. These happy conditions materially act in extending settlements and supporting a healthy population.

Professor Penck hazards (*op. cit.*, p. 486) 40 millions as the maximum population for Central Asia, the limits of which he does not define. I should multiply this by four for the Tarim Basin alone. And I cannot agree with his view of the low standard of life in Central Asia. If the standard of life is judged by a full belly, warm clothes, and fat children, then the standard is very high. In India during the cold weather warm clothes are rare, but there is not a Turki

in the land who has not a warm wadded coat. Standards of life are deceptive, for in India the peasant spends his money wildly and wastefully at certain times, whereas the Turki puts food and clothes before family, religion, ambition, education, or whatever sways the desires and opens the purse of mankind. It is comfort, first and last, that appeals to the Sart, and for that reason he will not tolerate conditions under which the Indian peasant lives contentedly, even though he could change them if he wished.

It is not so easy to estimate the potential increase in the pastoral areas of Kashgaria, particularly as southern Sinkiang possesses fewer true nomads than does the North, partly because there is less good pasture, and partly because the settled population send their flocks to the uplands, and encroach on the nomads, who find it difficult to secure fresh grazing grounds. There is however the same lack of system and control in the pastures as in the irrigation of the plains, and if the increasing number of nomads and their flocks is to be maintained, some co-ordination of their grazing is necessary. At present these pastures are divided off definitely but not equitably. For instance, the Qirghiz tribes in the Tekes valley urgently need new ground, while the Alaban Qazaqs close to them have more grass land than they need, but resist any intrusion of other flocks. South of the Tien Shan, particularly near Bai and Uch Turfan, the Qirghiz are harassed by Sarts who strive to drive them away, so that in self-defence the nomads are taking to agriculture in the Taushqan and Qarabagh valleys to increase their means of subsistence and to check the encroachment of the Sarts. No one takes any trouble about the rights of the nomads, who are nevertheless of great economic value, as their horses, cattle, and sheep are a source of wealth to the province.

The damage done to forest and pasture by neglect and waste is great and quite unchecked. Many trees are burnt every year by carelessness or laziness, and many are cut down and abandoned, while good pasture land is trampled on and rendered useless for subsequent use, just as many upland valleys are boycotted as being too remote, too cold, or merely inconvenient. There is no reason why this should be, and a little arrangement would remedy the wastefulness and muddle, but it must be remembered that pasture and forest cannot be increased like arable, and much irreparable damage is done. It is a reasonable estimate to treble the number of animals now existing that could be grazed. It is improbable that the interests of the pastoral races and the preservation of the forests will be considered, although especially near the towns of Ili (Kuldja and Chuguchak) the scarcity of wood is greatly felt. The riverine tracts in the Tarim Basin, and also in other parts of the province, support many sheep, and the toghraq forests (*populus balsamifera*) are damaged by lopping off the boughs to let the animals eat the leaves. Thus in many places there are only pollarded or stunted trees; the lack of new and adult ones means an ultimate decrease in pasture, both arboreal and ground. These stretches of toghraq and scrub grazing however are so immense that it will be years before the harm is felt.

North of the Tien Shan, and especially in Dzungaria and in many places in the Ili valley, many crops are produced in unirrigated land, and the wheat so

grown, especially on the low hills between Urumchi and Guchen, is particularly fine, and the opium, barley, and millet markedly good. There is, of course, extensive irrigation, but as there is also abundant rainfall, advantage is taken of it. In the Ili valley especially this is so much the case that whilst in 1928–29 there was a shortage of wheat and barley, in 1930 by planting every available unirrigated upland the harvest was ample, and flour cost less at Ili than anywhere else in the province, to the chagrin and surprise of the profiteers.

The farmers north of the Tien Shan are largely Tungans and Chinese, and are more industrious and intelligent than the Sart. In places, too, the soil is considerably richer with less loess and more humus. The air, too, is more humid. On the other hand, the climate is most unsettled and the crops are often ruined.

It is very difficult to foresee the future of Dzungaria, that great tract extending from the north of the Tien Shan to the Irtish river. After the fertile mountain slopes have been left, the country is thinly populated and largely desert, and it lacks the great rivers that are the salvation of Kashgaria. But far down the Manass river there are many settlements, and the possibilities of irrigation very great. It is however rash to hazard any estimate until the country is better known and more settled. Political conditions have been very unfavourable hitherto, and the fertile districts occupied near the mountains have been so often plundered and their owners murdered that the possibilities of future settlement can hardly be guessed at.

North of the Irtish up to the Great Altai, the only part of Outer Mongolia now in Chinese hands, the settled population is very small but is increasing. Barley and wheat are being grown, the climate is good but harsh in winter, and the future is favourable to extension. The pastures here and to the west, particularly about Chuguchak, are magnificent, and it is wonderful to see these glorious prairies where the flower-decked grass will hide a mounted man. Fine as are the pastures of the Tien Shan, those of the Altai, Saur, and Maili Bar appear even richer, and should be able to support a thriving dairying industry. The larch of the Altai is better grown than the spruce of the Tien Shan, but being remoter it has been less damaged than the latter forests. The Chinese would seem to have every reason to be angry over the way that the rest of Outer Mongolia has been filched from them.

One must bear in mind in concluding this brief account of the habitability of Chinese Central Asia that the skilful use of modern methods of irrigation and agriculture alone can turn this vast empty province into a smiling and populous area. It is possible that the world's needs may never demand this transformation, but it is a feasible one. Perhaps an awakening China, wondering where to settle its surplus millions of people, may have the good sense to call in the science of the West and to develop Sinkiang. There, secure from the annual dread of floods, the industrious Chinese peasant could dwell in contentment to the infinite benefit of himself as well as of his immediate neighbours and of the world at large.

SHEET-LINES

BRIGADIER H. StJ. L. WINTERBOTHAM, C.M.G., D.S.O.,
Director-General, Ordnance Survey

WHEN maps were copper engraved and printed there was, of necessity, a rigid sheet-line system. There was no easy way of changing area, and since the sheets were in those days small, the most absurd divisions resulted. London, Carlisle, Cheltenham, Derby, Dumfries, Glasgow, Inverness, Loughborough, Oban, for example, were all cut by the 1-inch sheet-lines into two or more parts. Some of the 1-inch sheets had but one or two square miles upon them; Portsmouth, Worthing, Eastbourne, Felixstowe, Whitby, and many others appeared on sheets which gave no idea of their land approaches. It was not so much that the convenience of the public was forgotten as that the technical processes involved insisted on this rigid and uncomfortable division.

Presently lithography came to our aid. The bicycle was enlarging travel and the folding was easier and more efficiently done. Sheets became larger and were printed from stone, the work being transferred thereto from the copper originals. It was early however to recognize the freedom which this change offered. Sheet-lines were still considered as fixed by the combined plates. The various scales, 1-inch, $\frac{1}{2}$-inch, and $\frac{1}{4}$-inch, were arranged on the same index in multiples without considering the possibility of redesigning the sheet-lines of each scale to suit local convenience.

It was at this stage in our history that we began to issue District Sheets to meet local requirements. Strangely enough these early district maps were not published in full colour. They were just the black outline with one coloured road plate. They did however have some vogue. Perhaps they never attained their full usefulness because of the system or systems then used for identifying a point on a map. A reference such as "Sheet 44, 1-inch S.W. of the third l in Llanelly" can apply only to one sheet. It cannot be universal and is bound to retard freedom in altering sheet-lines.

Maps were at this time of increasing interest to soldiers. The South African War and the Staff College between them were responsible for staff rides, exercises, and manoeuvres innumerable, and the overlap system adopted by some map-publishing firms became very popular. The Ordnance Survey did not then adopt this solution, although it has later done so. An overlap is some conventional one or two inches or miles added to two sides of each sheet (say north and east) thus overlapping the sheets south and west. This sort of arrangement removes one a step from the danger of being at the corner, and, since the sheet-lines of that period gave little information, an overlap made it easier to find the way from one sheet to another.

During the Great War we were blessed with a fairly good system of map reference and rectangular sheet-lines. It was easy enough to patch and alter, especially as one did not get to bed until the work was done. Most eminent soldiers about to fight a battle had special sheets with enough room on one side for preparatory manoeuvres and enough on the other to hold out some hopes of territorial gain. Then administrative arrangements refused to be arbitrarily curtailed within sheets, and training areas, traffic controls, and a host of such

A Sheet of the One Inch First Edition (1881).

Diagram 1.

Sheet Lines of No. 132 One Inch Popular Edition and the special Sheets found necessary for local convenience.

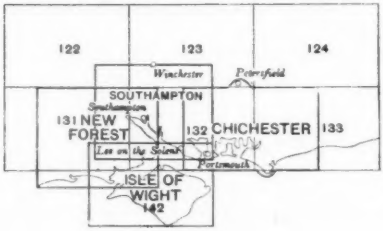


Diagram 2.

International 1/M

Diagram 3.

International 1/M

Diagram 4.

matters meant more patching and matching. More interesting perhaps were the special area maps, such as The Artois Front and The Picardy Front, which expressed a real individuality of physical type and therefore of minor tactics. For obvious reasons one learns in war to serve one's audience without giving way to either conservatism or inertia. Curiously enough I met few soldiers who wanted an overlap, though many who were "at the corner of four sheets." An overlap is of little value if the referencing is easy and margins are helpful.

After the war Sir Charles Close began those measures which, together with the growing map sense of to-day, have kept our salesmen and our machines busy. The taxpayer began to reap where he had sown and the man in the street began to criticize and select. Recent years have made it abundantly clear that we must for ever be rearranging sheet-lines for his convenience, or very naturally he will not buy. There appear to be three general considerations which govern his taste in sheet-lines. Local patriotism, business convenience, and individuality of physical type.

Devonshire falls very happily upon two sheets of the ½-inch which used to be called respectively, Bideford Ilfracombe and Tiverton, and Plymouth Torquay and Exeter. Local patriotism suggested the better titles North Devon and South Devon with the happiest results. This fact makes it clear that the ½-inch is a convenient County scale and might be so used. That excellent map the Ten Mile was brought out in three sheets with a generous overlap. But No. 1 did not include the whole of Scotland. We ate humble pie and added as much as would reunite her in one sheet. This happy but simple solution, which has revolutionized sales, might well have been a matter of initial policy. But patriotism is not everything. There is an excellent 1-inch of Aberdeen which shows a long strip of land. It includes however a good deal of sea, and in the words of a map agent of those parts is "scarcely a good return for the money." One wonders what local patriotism has to say in connection with those "insets" sometimes used to include outlying islands or promontories. A case in point is that of the Scilly Islands. Hitherto they have formed an inset on the nearest 1-inch sheet of Cornwall. We are going now to produce a separate 2-inch to the mile sheet of the Islands themselves, and I suspect that the change will be welcomed by both natives and visitors.

Business convenience is more formidable both to understand correctly and to cater for. Consider the Portsmouth–Southampton 1-inch sheet. It is admirable for an inhabitant of Lee on the Solent, but of little value to a Pompeyite, and less to a Southamptonian. This fact has led immediately to three special sheets, one of Southampton, another of the New Forest, and the third of Portsmouth and Chichester.

It would not be wise to break up the regular design and sequence of sheets to meet each such case as the foregoing. For purposes such as regional planning it is essential to maintain a regular series which can be joined up easily. Here we come as a matter of curious fact to one of the grave inconveniences of an overlap system. It is evident, none the less, that every case of awkward business design in the general scheme must be amplified by special district or tourist maps.

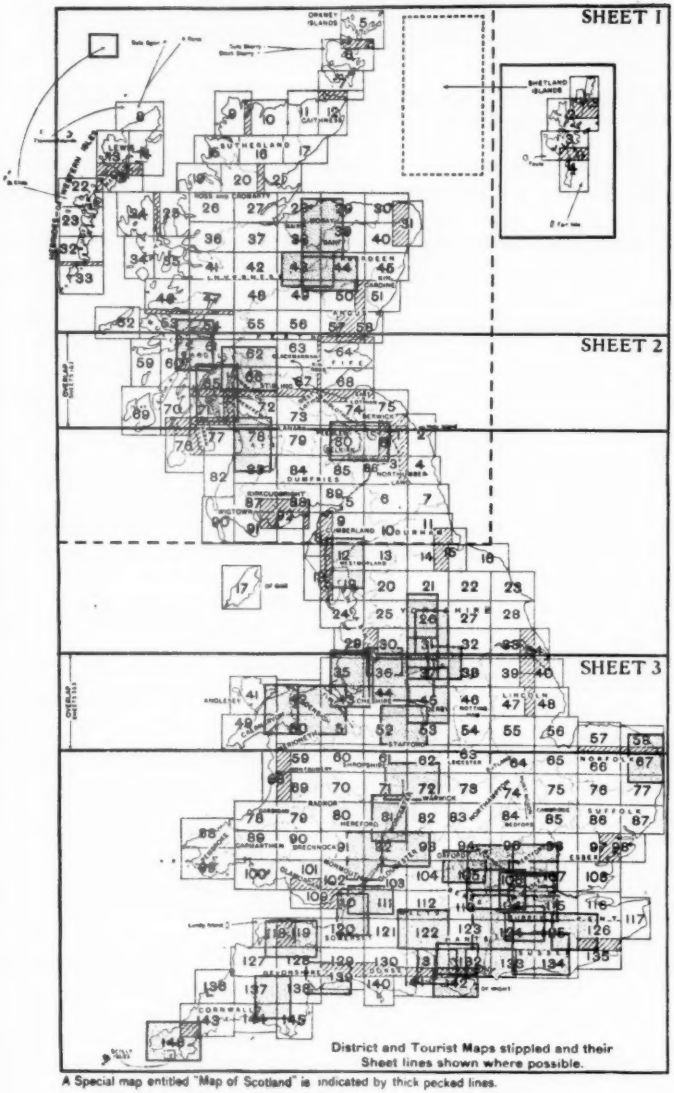
The sheet-lines of the new ¼-inch, by far the best motoring map, were derived directly from the ½-inch, but made two real howlers: they separated

DIAGRAM

showing the Sheet numbers of the

TEN MILE & ONE-INCH POPULAR EDITION MAPS

of the Ordnance Survey of Great Britain



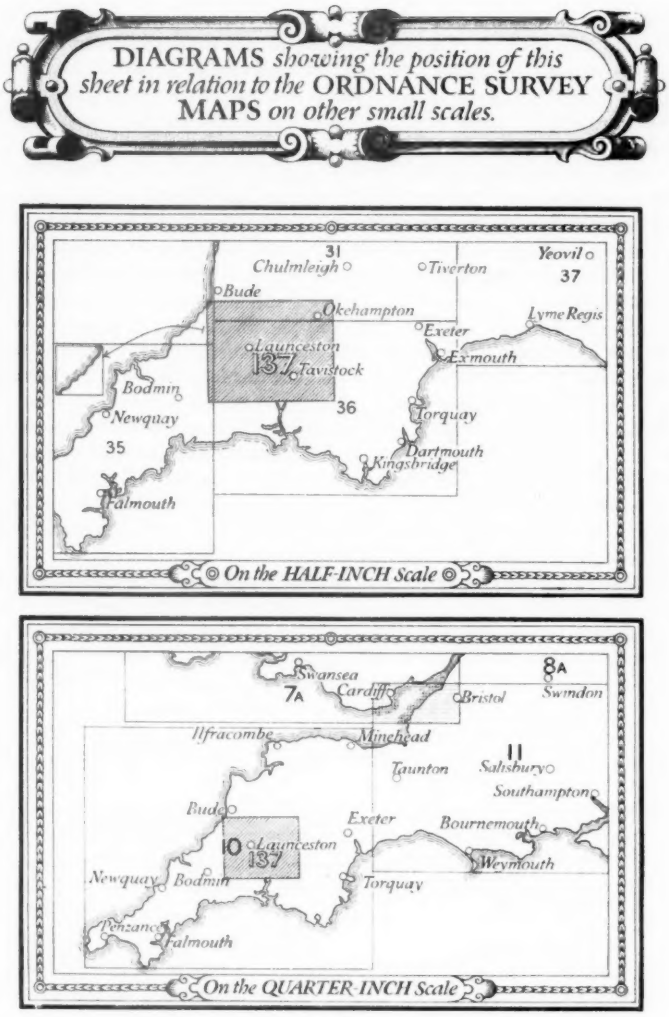
A Special map entitled "Map of Scotland" is indicated by thick pecked lines.

the business centres of the West Riding and of Lancashire, and they separated Edinburgh from Glasgow. The more human division of our later sheets has done much to add to their popularity. This is an instance of a division natural on the ½-inch but quite inapplicable where applied to the smaller scale and larger area of the ¼-inch. London of course offers such a market that one can afford to offer a choice of business sheet-lines. The normal 1-inch cuts London into four quarters (with a generous north and south overlap). But there are also the North London and South London sheets, and that most useful of all: London and the Country round.

Individuality of physical type may become important on account of work or of play. So far as is possible every area of real individuality has its own sheet whether Tourist or the humbler brother the District Map. In Great Britain we have no less than fifty-seven such sheets on the 1-inch (for example The Lake District), and two on the ½-inch (where the area is too great for presentation on a single 1-inch: for example The Cotswolds). New centres of population, new movements such as hiking, new playgrounds such as Whipsnade, must and do mean new sheets, and yet the ordinary series does not seem to suffer.

Corners are naturally more tiresome as they grow comparatively more frequent. To remove a man from his corner on the 25-inch in any large or systematic way is beyond praying for. Yet even here a strict adherence to pattern may become ridiculous. The island of Inishmurray is cut into quarters by sheet-lines which are not of any real importance. Special sheets can always be made up (as, for example, in town planning), but normally only at the charges of the unfortunate victim himself. On the 6-inch a little more can be done. We are beginning to put together, by direct transfer, the portions of any town torn ruthlessly asunder by sheet-lines and to put the result on the market as a town map. These maps are considered simply as aids to finding the way and not important in accuracy or durability. They are printed, without touching up, on cheap paper.

At the other end of the gamut, on the very small scales, it is possible to escape sheet-lines altogether in so small a country as our own. By employing the Ansel folding, for example, a man may use a 10-mile map from John o' Groats to Lands End and never be on edge or corner. A small-scale series may however show very awkward sheet-lines if more than one sheet is required. It is perhaps with the International 1/M that one finds the greatest difficulty. There is something rather pleasing in a series which treats national boundaries with so little respect. As the gaps in this series fill up and as people learn how much a map can help in synthesis, how much more it can show relative values than many books, so the popularity of the international sheets will grow. They will never get much of a market because the sheet-lines are so dreadfully inconvenient for every-day national use. A sheet which separates Kent from England and joins it to France and Belgium will not, for ordinary use, appeal even to those two gentlemen, the man of Kent and the Kentish man. Following the Danish example we are now joining up our eight international sheets so as to cover Great Britain with two (with a generous overlap between them), while of course retaining and keeping up to date the true international sheets. The international sheet-lines have however proved useful to those who desired to



End-papers of a modern one-inch map

make a contribution and who had some suitable promontory or corner separated off by obliging sheet-lines, and yet suitable for the purpose. Sometimes, even for international treatment, the conventional divisions should be ignored. Undoubtedly the American Geographical Society did a wise thing in extending the eastern edge of sheet N.E.19 (Santo Domingo–San Juan) to include the whole of Puerto Rico.

There is a moral for map-makers in all this. If dividends are important, then sales must be coaxed. It is not much good to-day offering a man something he does not want, and he is quite right to consider that sheet-lines are made for his convenience and not he for theirs. Three things are however of great importance in all this jugglery. A good system of reference independent of sheet-lines, a rectangular pattern of sheets, and good marginal and end-paper information. Perhaps margins and end-papers deserve a note or two. A fifty-year-old margin is not very helpful. It may direct you to the neighbouring market town, but if it does the name and the distance will be given extremely small. In these days the quietest of folk move much faster and farther, and the margin directs them clearly and plainly perhaps to London, or perhaps to the county town. I cannot imagine much difficulty nowadays in passing from one map to another. End-papers help in their way, for in the extremely modern map will be found on, or inside, the cover, indexes which place the map in question on other scales and on the countryside. There is such and such a town and there is the sheet-line.

Some day perhaps we shall have A and B series, the one overlapping the other by halves in each direction. Even so there will still be sufferers. Meantime we must be content with a general overlap and the special sheets.

NOTE ON PROFESSOR KITIRŌ'S METHOD OF ORTHOGRAPHICAL RELIEF

BRIGADIER H. StJ. L. WINTERBOTHAM, C.M.G., D.S.O.

IN the March number of the *Journal* Professor Tanaka Kitirō, of the Imperial Kyushu University, described an original, ingenious, and interesting method of natural hill shading. I use the word "natural" here, in the sense that he does, to differentiate imitations of nature from pure convention.

First of all let me add to what the Editor of the *Journal* has already said about the way in which the light falls upon Professor Kitirō's example. In his mathematical analysis, as in his illustration, Professor Kitirō thinks of the sun as the important factor in determining the direction of light. The sun does not shine through the second button of the user's waistcoat. What gives the impression to the map user is a light which falls upon the map from the direction opposite to himself. As most maps are oriented towards the north it is from the north (or, on a table, from the north-west) that the light falls, and it is this light which should be the guiding factor in placing the shadow.

The method is one of inclined contours which can be drawn with precision and require from the draughtsman neither imagination nor aesthetic sense. It illustrates steepness of slope, which is exactly what hill shaders have always been at. Like them, Professor Kitirō gives no precise data, nor does he add to his impression of slope one of the relative importance, or mass, of his mountain features. Whilst then the method is ingenious, it does not absolve us from the necessity of adding something which will give the precise as well as the impressionistic effect, nor does it make it less important to emphasize relative height and size. To bring the matter down to a strict parallel with our new 1-inch sheets, his method would do away with the hachure plate and with the shadow plate, but would not affect the contours or the layers.

Now let us study those instructive illustrations opposite p. 213 of the March number. Does Fujisan show us its real importance? To those who have seen it, and who are drawing upon old memories, perhaps. To the rest, I think not. The very simplicity and regularity of its shape defeat the treatment. The smaller, more irregular features around assume undue importance. Has the inclined contour done more than hachuring plus shadow would have? I do not think so. The relative size and importance of features suffer from the effect of lines all over the map.

I give illustrations of the country round Perth. There is a charming diversity about the Perth countryside for a cartographer's purpose. It has town and hills, water, wood, and communications. It has served as a background for more than one cartographic experiment. Now I admit that in this experiment we have not followed Professor Kitirō's instructions to the letter. Our parallel construction lines (drawn from north-east to south-west—so as to put the source of light north-west) were 40 to the inch because we had such a plate available. The ideal number according to Professor Kitirō is 53, when working on a 2-inch scale and 50 feet contour interval. With the data which we found it convenient to employ for test purposes our "sun's" altitude becomes 52° 51′ instead of the 45° recommended. The general effect can be seen well

enough however. Steep slopes do show up, but the easy rounded slopes so usual in this country do not. There is in fact little justification for most of the line work of the inclined contours on this sample, and there is so much detail to show on the map that we cannot afford to spill ink to no purpose. We do not want more than half the area of shading I have shown, for only a half is significant.

Here a further point of importance in cartography arises. With a tint (or shadow) of lines the shade of ink must be darker than if a solid colour is used. The dark tint necessary for this line work must quarrel with the clarity of detail, symbol or name, much more than the solid, and the inclined contours cover not only hill and slope but also valley and plain where detail is thickest.

Consider now the economics of the question. An expert draughtsman finished about 28 square miles (drawn at 2 inches to a mile) in twenty working hours. The country is easy and bold in relief. Supposing we say that 2 square miles an hour of average country could be done with practice. But this is some ten times as much labour as we employ for a similar purpose. For the Ordnance Survey of Great Britain, then, this method is unsuited.

It is not fair however to dismiss so original a contribution to cartography because of the peculiar circumstances of a survey as rich in material as we are. There are two cases in which I think inclined contours would be uncommonly useful. The first is to supply a shading to a good, horizontally contoured study of a single but striking massif—such as Ruwenzori, for example. The second is for maps of such country as Northern Burma or South-west Persia at some small scale. In the first instance the shading would explain the minor and subsidiary features without bringing in relative vagueness, compared with other neighbouring masses. In the second, the drainage scheme would be cleared and illustrated and there would be small need for accentuating the relative heights of parallel mountain chains.

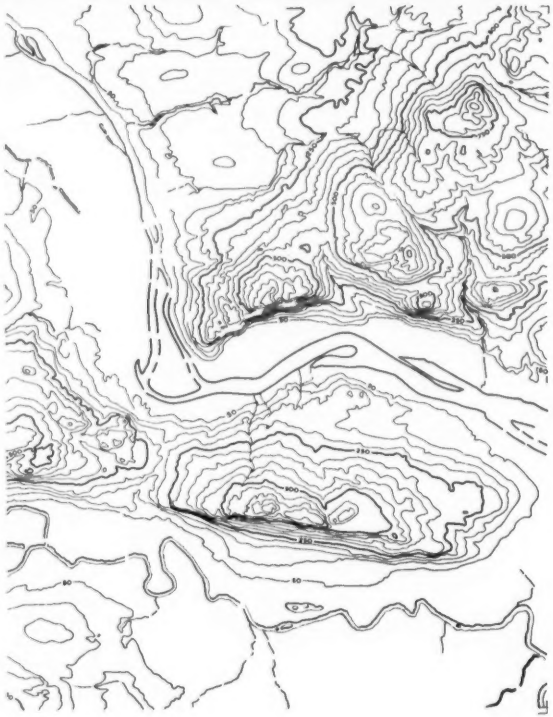
As a general conclusion however I do not think that we can recognize in the inclined contour an escape from that combination of natural and conventional methods which, properly blended, safeguards proportion and illustrates shape.

Ordnance Survey Office, Southampton. 10 *October* 1932.

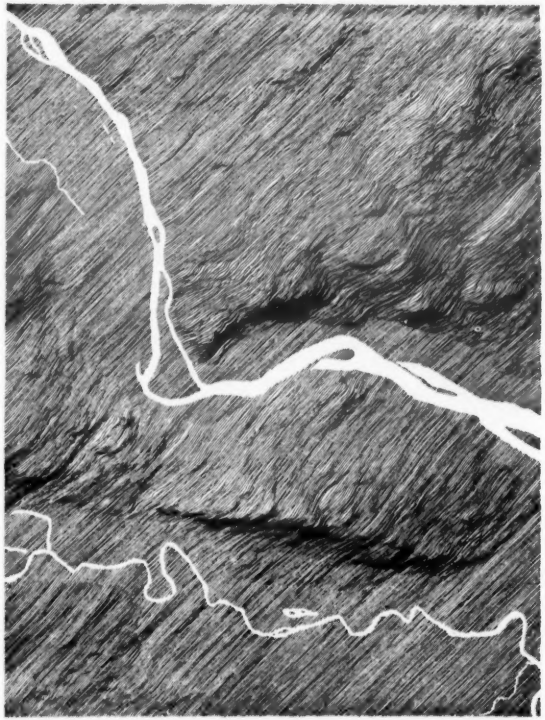
FREDERIK HENDRIK ISLAND

FREDERIK HENDRIK ISLAND is on the south coast of Dutch New Guinea and has an area of about 4000 square miles. It is described in the Admiralty Pilot as "low, covered with a dense forest, and so marshy as to be almost inaccessible," and the Dutch map 'Schetskaart van Nieuw Guinee (Nederlandsch Gebied),' scale 1 : 1,000,000 (*Batavia: Topogr. Inrichting* 1919), shows nothing in the interior except the conventional sign for "Swamp and marshy land."

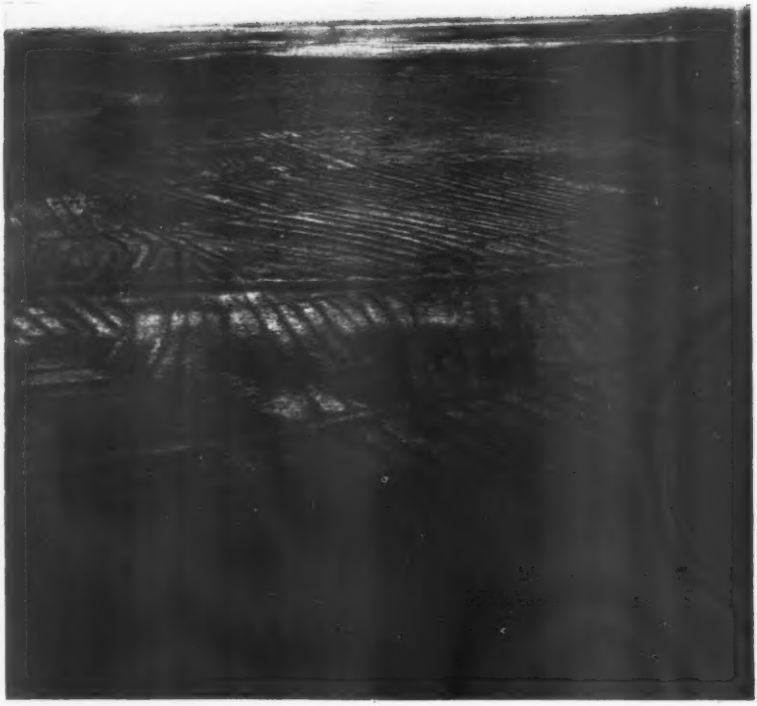
In July 1931 while flying over the island Mr. F. C. Chichester observed that the interior was flat and appeared to be covered with thick swampy grass, but a large area was laid out in raised strips of uniform width with what looked



1. Contours of the country round Perth



2. The same with hill shading by the Orthographical Relief method of Professor Kitirō, drawn by the Ordnance Survey



Frederik Hendrik Island: air photograph of part of the interior by Mr. F. C. Chichester, showing apparent agricultural and drainage operations on an extensive scale

like deep drains between. At intervals deeper cross drains cut through at right angles. The whole appeared to be uncultivated and covered with high grass except in a few tiny patches of cultivated ground which had young banana plants. These were on the side of one of the long ridges. The accompanying photograph is made from the small negative, unfortunately much under-exposed, which has been placed at our disposal by Mr. Chichester. His local information was that no white man had yet penetrated the island, and we cannot find in the Society's Library any account of any journey into the interior, though the coast has been charted. The structure disclosed by the photograph seems to show that at some time there had been extensive operations of agriculture, and we are glad to direct attention to the matter in order that if it is impossible to penetrate the island on foot it may be systematically photographed from the air.

ANOTHER LAFRERI ATLAS

EDWARD HEAWOOD, Librarian, R.G.S.

ALTHOUGH collections of sixteenth-century Italian maps, many of them bearing Lafreri's imprint, are by no means uncommon, they have mostly been brought together in a somewhat haphazard manner, and it is incorrect to speak of them, as is sometimes done, as "Lafreri Atlases." A few however do give indications of having been originally issued by the firm in practically the same form in which they now appear, one such being possibly the volume acquired by the Society in 1929 and described in the *Journal* for April of that year; for it included the engraved title-page not very commonly found, though the binding was much more modern. A volume which seems to be still more certainly in the state in which it was issued (apart from a later re-backing) was recently acquired from the Milton-Abbas sale by Mr. Francis Edwards, who has kindly allowed us to examine it. It too has the title-page, and the ninety-six maps are nearly all known to have been on sale by Lafreri or his successors at Rome; maps bearing a Venice imprint being almost entirely absent. It should however be rather spoken of as a Duchet than a Lafreri Atlas (Claude Duchet being nephew of Lafreri and part-heir to his property), for the number of maps bearing his imprint is unusually large, and some of them are dated after the death of Lafreri in 1577. The latest dated item, the plan of Palermo, is of 1580, and the date of the whole collection may be tentatively placed between 1580 and 1585, the year of Duchet's death. It cannot be later than 1596, since the title-page bears that date after the name of the first (?) owner, Hieronymo Cunoni.

As in so many similar collections the maps are all brought to a standard size (all, that is, that are not so large as to require more than one folding) by the addition, when necessary, of blank margins, and these give a further indication of the original character of the volume, since the paper of all that bear a water-mark shows precisely the same device—the pilgrim in a circle with star above—a variant of No. 52 of the figures given in the *Journal* for May 1924. Of the maps themselves with a decipherable mark, some 86 in all, by far the most

common mark is also the pilgrim (in slightly varying forms) found on about 26, while the next commonest are the anvil (on 16, see Figs. 48, 49, May 1924) and the large M with star (Fig. 43, *ibid.*); the lamb (Fig. 43, *ibid.*) comes a good way behind, on 6 maps only, while some 16 other marks occur from one to four times each. Of all the marks the great majority are recorded also from paper known to have been used in Rome, and there is little doubt that practically all the maps were actually printed there.

The Roman provenance of the Atlas, and its probable issue as a whole from the publishing house of Duchet, are brought out still more clearly by an examination of the imprints of the maps. In the Wyld atlas described in the *Journal* for April 1929 only two maps bear Duchet's name, and in the four lists given by Wieder from copies bearing the title-page, only five do so, while in the Library of Congress set (also with title-page) there are still only eight. In the set now described the number is increased to fourteen. Lafreri's name still appears on about the same number, and those of other Roman publishers or engravers taken together on twelve more. On the other hand none of the maps is put down as *printed* in Venice, though the names of Venetian cosmographers or engravers still appear on about ten. These are principally Gastaldi maps, the plates of which are in some cases known to have been acquired by Lafreri. Of the maps with Duchet's imprint, some are merely copies of earlier versions, or are actually old maps with new imprint, but a few are of greater interest as not found in the earlier collections. There is, *e.g.* a larger map of the Holy Land, on two sheets joined, than those usually given; a re-engraved version, dated 1579, of the Africa originally signed by Furlani of Venice, the engraver being now one not otherwise represented, Henricus Honius of Haarlem; a plan or view of Palermo, by Presbiter Horatius Maioc, engraved by Natalis Bonifacius, dated 1580; one of Algiers as fortified in 1579; and a plan of Augsburg, not dated. These have been best known from single copies, probably issued separately. A rarer, possibly unique, map is one of Italy by Mario Cartaro, not known to Almagià when he described the work of this Roman Cartographer in 1913 (*Riv. Geogr. Italiana*, vol. 20). It appears to be one of the many reductions of Gastaldi's larger map.

Apart from Duchet's additions, and the dropping out of some Venetian items, the volume is very similar, as regards general arrangement and contents, to that given to the Society by Lord Peckover. Neither would thus appear to be merely factitious collections.

TWO NARRATIVES OF THE GREENLAND EXPEDITION

NORTHERN LIGHTS: the official account of the British Arctic Air-Route Expedition. By F. SPENCER CHAPMAN [and others]. *London: Chatto and Windus* 1932. 10×6½ *inches;* xvi+304 *pages; illustrations and maps.* 18*s*

THOSE GREENLAND DAYS. By MARTIN LINDSAY. *Edinburgh and London: William Blackwood & Sons* 1932. 9×5½ *inches;* xii+256 *pages; illustrations and sketch-maps.* 15*s*

THE story of the British Arctic Air Route Expedition of 1930–31 is told twice over in these beautiful and attractive volumes, each of which will charm many readers. The plan and results of the expedition organized and led by

Watkins have been dealt with so fully and recently in these pages that it is unnecessary to recapitulate the events. Some readers, remembering earlier reports in the daily press, may feel a little disappointed at first by the simple facts now quietly narrated by the sober and level-headed young men who actually experienced and now describe them. To the serious reader these books bring no disappointment but a sense of satisfaction that the men who had so many hair-breadth escapes and exhibited such marvels of endurance should retain a fine sense of proportion in relating them with the restraint and humour of English gentlemen.

Our Society approved the plans, assisted the work, discussed the results obtained, and rewarded the leader by the award of a Royal Medal. The Navy, the Army, and the Air Force allowed several of their most promising young officers to take part in the expedition, and the King has lately been pleased to bestow the rare and coveted decoration of the Polar Medal on all the members of the expedition—for two of them unhappily the honour is posthumous.

Watkins worked on original lines: as a leader he kept his men together by comradeship rather than by subordination, and there was a pleasing absence of the usual restrictions as to the rights of the leader to exclusive authorship. It was expected merely that no member of the expedition other than the leader should publish a personal account until a year had elapsed after the return of the party. But, in fact, Watkins was devoting all his energies to the organization of an expedition to cross the Antarctic Continent, and when that project could not be realized, to a fresh Greenland expedition; and this allowed Lindsay's lively volume to anticipate by a few weeks the more staid official account entrusted by the leader to Chapman. This circumstance enables us to deal with the two books in one review.

Both volumes are admirably produced and illustrated with many fine photographs. Travellers have often felt constrained to reproduce pictures of particular scenes irrespective of their quality, and even in these days of high technical skill it is rare to find a large collection of pictures such as these, all perfect in composition, focus, and exposure.

Although the two authors do not differ much in their points of view or in their cheery handling of incidents, the double description of some of the journeys and of the routine at the Base station enables a sort of stereoscopic impression to be produced, more realistic than either alone could make it. Perhaps Lindsay's book is the more successful as a literary effort, for it is written with the freedom of an individual keenly interested in the expedition but without responsibility for its plan or its outcome. Chapman's work, on the other hand, bound to give equal attention to all parts of the enterprise and to present statements of fact rather than personal impressions, is a solid contribution to the history of exploration. This being so we refrain from a more detailed consideration of the pleasant pages of 'Those Greenland Days,' and turn a more critical eye on the more important though no less fascinating work.

As its title indicates, 'Northern Lights' is not wholly official or scientific. It gives an agreeable account of events, and its style is in general worthy of its handsome format and artistic production. Seven short appendices give a concise summary of the technical and scientific work which was done, the detailed discussions being postponed until reports by specialists are available. Sir William Goodenough has written a sympathetic appreciation of Gino Watkins as a Foreword, and Watkins himself an Introduction setting out the purpose of the expedition very clearly and concisely. Lemon writes the account of the open-boat journey in an interesting if unemotional manner, but, especially towards the end, his work shows less firmness of grasp and there is a regrettable vagueness

as to dates and distances. This might be a merit in a book designed for the entertainment of general readers, but is a defect in an account which mainly appeals to the student. It is only in J. M. Scott's treatment of the journey over the Ice Cap to Ivigtut that we find clear details of the date and distance of each day's journey in tabular form, and this we should have liked to see extended by the addition of columns of temperature and altitude. Such tables are of more permanent value than descriptions however pictorial, and without them one cannot compare the performances on the various land journeys of this expedition with others in the past. Courtauld contributes a most interesting little chapter on his solitary life on the Ice Cap, revealing the peculiar fitness of his temperament and mental outlook for an experience which did him no harm, though it might have been a terrible ordeal to another.

Chapman's own descriptions of life at the base and of journeys by boat and by dog-sledge are full and careful, without lacking an ever-present human interest and always giving an excellent idea of the peculiar conditions of camp life in Greenland. It is easy to see from them how the lower latitude and warmer summer climate make conditions far more trying than those which obtain in the Antarctic regions where travellers are at least free from the aggravation of heavy rain, thawing snow, and rushing rivers. There are charming sketches of the life of the Eskimo, who on the east coast retain to this day the close harmony with his geographical environment brought about by generations of isolation from the civilization of less arduous climates.

Chapman, after finishing the writing of his book, had to leave with his leader for the second Greenland Expedition before the work was ready for the press, and J. M. Scott undertook to complete the preparations. It seems almost unkind to look too closely at work rushed through in such conditions, but there is one defect which detracts from the permanent value of the book as the official account of an expedition which must be referred to frequently by future polar students and explorers. This is the absence of an index and the consequent difficulty of comparing the equipment and the work performed on the different journeys and still more on different expeditions. An official account differs from a popular narrative mainly by its claim to permanent value. Such records of past achievement are the material from which plans for future work are made, and their contents should be made accessible by every device of classification and indexing. No doubt the compilation of an adequate index would have delayed publication, and the advantage of prompt appearance may to some extent outweigh the inconvenience at the time. But if a second edition is called for an index ought certainly to be supplied. And in a second edition the clean symmetry of the headlines might yield what aesthetic charm it may possess to the practical needs of those to whom books are not so much things of beauty as tools to work with, for all book-users like the page-numbers at the outer edge of the top line. The book is well illustrated by the maps which were originally drawn to accompany the various papers on the expedition which appeared in the *Journal*.

Only the general excellence of Chapman's book justifies one in calling attention to the fact that it might be still better. These bibliographical deficiencies are more than counter-balanced by the geographical value of both books. It is good to see that men who excel in feats of skill and endurance, as dog-drivers, ski-runners, mountain climbers, navigators of kayaks and open boats, have also the literary gift of making their achievements vivid to the minds of those who stay at home. It is delightful too to observe the modesty with which each man refers to his own contribution to the success of the expedition, and the generous way in which he recognizes the work of the others.

HUGH ROBERT MILL

REVIEWS

EUROPE

HIGHWAYS AND BYWAYS IN GLOUCESTERSHIRE. By EDWARD HUTTON. *London: Macmillan & Co.* 1932. 8×5 *inches;* xviii+468 *pages; illustrations by* HUGH THOMSON; *map.* 7*s* 6*d*

The Highways and Byways series has already covered north-east Gloucestershire, down to Painswick and Cirencester, in the 'Oxford and the Cotswolds' volume, published as long ago as 1905; and it is interesting to compare the pen-and-ink drawings of F. L. Griggs with the pencil illustrations of Hugh Thomson, especially of the same subjects. Perhaps the more careful work of the former is the most successful with the Cotswold stone buildings. The latter sometimes fails to bring out their full attractiveness; his drawing of Owlpen Manor gives an inadequate idea either of the charm of the building itself or of the beauty of its situation. And the author's description of Owlpen is also somewhat inadequate; it is just "a most romantic many-gabled manor-house in a deep-wooded combe." He seldom attempts any detailed account of domestic architecture. Now, if there is one part of England where the domestic work has the advantage over the ecclesiastical, it is the Cotswolds. There are of course exceptional villages like Northleach where the church is predominant; but in recalling the Cotswolds it is the cottages and small houses that leap to the mind's eye. Mr. Hutton however is ecclesiastically minded. His account of a village is apt to degenerate into a guide-book catalogue of the parts of the church, thus: "It consists of nave, north and south aisles, south porch with parvise over, chancel and tower with spire. It is chiefly Transitional with interesting arcades. In the fourteenth century the western bays of the nave were added, etc., etc." All this is no doubt accurate enough and useful for reference, but with constant repetition renders the book boring to read. If a place has a modern church, it loses much of its interest for Mr. Hutton. Of Tetbury he says: "The present church is modern; indeed the town is quite without any buildings of historical or architectural importance"; and there is Mr. Thomson's drawing of the market-house to confute him. This drawback of a modern church probably spoilt Owlpen for him and made him ignore Snowshill. The scenery too, except in the Forest of Dean, receives scant attention compared with the churches; he seems to miss some of the best parts of the Cotswold escarpment, one of Gloucestershire's most striking and lovely features. The map might well have indicated the three very marked physical divisions of the country—wold, plain, and forest. The book is best on the historical side; the accounts of Roman Cirencester and Gloucester are especially well done. But the Reformation is anathema. J. H. R.

NORTHUMBERLAND AND DURHAM. By IRIS WEDGWOOD. *London: Faber and Faber* 1932. 10×7 *inches;* 192 *pages; illustrations and maps.* 5*s*

The most remarkable feature of this volume is its price. Not only is the text admirably printed but it is profusely illustrated with over a score of excellent photogravures and no less than three score of pleasant drawings by G. E. Chambers; and all for five shillings. Lady Wedgwood's object in writing the book is to entice visitors to these northern counties by showing them that here are objects of interest and beauty no whit inferior to those in more frequented holiday grounds. In this she will certainly be successful; a perusal of the pages makes the southerner want to take the next train to the north to see these things for himself. There is not only the sturdy northern building, whether it be the great wall of the Romans, the Norman arches at Lindisfarne, or the Renaissance stairs

at Chillingham; but within a few miles of the densely populated coalfields there are heathery moors, crag-guarded tarns, and shining streams in a solitude as complete as any county can offer. Nor is more sophisticated scenery wanting. Lady Wedgwood is at pains to explain to us that this is not the bleak and almost perennially frost-bound country that some southern folk imagine it to be, but that here are luscious pastures and cornfields, gay flower gardens, and parks with noble trees, and above all that, though "the sun has been engaged to shine particularly in Devonshire," it also shines upon Northumberland. She touches on some of the many historical scenes which have been enacted in this region, but wisely leaves to guide-books the things that pertain to guide-books. Few modern writers could have refrained from giving lengthy descriptions of Hadrian's Wall and Durham Cathedral. J. H. R.

A HISTORY OF PLYMOUTH AND HER NEIGHBOURS. By C. W. BRACKEN. *Plymouth: Underhill* 1931. 9×5½ *inches;* xvi+312 *pages; illustrations and maps.* 6*s*

This interesting and on the whole trustworthy account of Plymouth and her neighbours, Plympton and Saltash, has a foreword by Lieut.-Colonel W. P. Drury, C.B.E. The greater part of the matter has appeared in weekly articles in the *Western Evening Herald*. "This toun," wrote Leland, "about King Henry the 2. tyme was a mene thing as an inhabitation for fischars, and after encreased by a litle and a litle." In her surroundings of sea and moor Plymouth is fortunate, though in her mass of buildings, apart from the fine municipal centre, she appears rather a drab creature by reason of her stucco and slate very little relieved by trees. These pages are packed tight with information about all the periods of the history of a very remarkable city; of the twenty-seven chapters in which the story is unfolded not the least edifying are those (chapters 22 and 23) dealing with the change from packhorse to railroad and the development of local commerce. In his wish to bring definiteness to early times the author has stretched a point or two. He seems to quote Ptolemy with approval in his dictum that Trematon Castle was "the headquarters of the Second Augustan Legion"! And the Ridge Way at Plympton he says has always been considered as part of a Roman road from Exeter *via* Haldon, Newton, and Totnes. There is but very shadowy evidence for this route from Newton to Plymouth and a crossing of the Tamar. S. E. W.

MAP OF NEOLITHIC WESSEX. Southampton Ordnance Survey. Introductory Notes: 35 *pages.* 4*s*

This canvas-backed map, on a scale of ¼ inch to 1 mile, covers an area from Williton in the west to West Wittering in the south-east, and from Stanton St. Quintin in the north to the Bill of Portland in the south, that is, it represents Sheet 11 of the ¼-inch Ordnance Map. Both terms, Neolithic and Wessex, are used with a little latitude, but the title is justifiable. The pattern in the map tells its story with admirable clearness. The background consists of white and orange shadings denoting different altitudes up to 200, 400, 600, 800, 1000 feet, and over, and of green markings for forest and marsh areas, the former being deduced from geology, as presumably the heavy clay lands were in Neolithic times covered with dense forest of which the chalk and limestone regions were free. Very faintly marked in grey—perhaps a shade too faintly, as they are not legible without perceptible eye strain—are modern place-names, so that the ancient monuments can be seen in relation to modern topography. The map indicates by obvious symbols the positions of long barrows, burial chambers, stone, wooden, and earthen circles, habitation sites, inhabited caves, and flint mines.

The main story of the distribution of Neolithic man over the region is appreciated at a glance, and the student is led by the eye to make inferences such as are propounded in the helpful introductory text. The items plotted in are numbered from 1 to 187 as consecutively as possible from north-west to east and south, and corresponding to these is a schedule which gives in each case name, county, and number of 6-inch sheet, latitude, longitude, height above sea-level, type of monument (by initials), and the chief bibliographical references. The inclusion of this last item is much to be commended; the value of the Ordnance Survey Map of Roman Britain would be much enhanced by a similar apparatus, though, owing to the great number of objects included, numbers would be impossible unless the map were produced on double the present scale. For every site marked on the map under review there is a record card available at the Ordnance Survey for reference. The introductory text explains geologically why the objects are found in clusters only in certain parts of the map, and why some of the main lines of communication were in the neighbourhoods of Lacock and Frome. For clarity, accuracy, and fullness this archaeological aid is deserving of very high praise. S. E. W.

THE MESOLITHIC AGE IN BRITAIN. By J. G. D. CLARK. *Cambridge: University Press* 1932. 10×7½ *inches;* xxiv+222 *pages; illustrations and maps.* 15*s*

Whether there was a distinct break, the so-called *hiatus*, between the Palaeolithic and Neolithic periods of Prehistory was for long a subject of controversy. There was however always the feeling that the hiatus was more apparent than real, and that further research would fill up the gap. The discovery by M. Piette in 1895 at Mas d'Azil of deposits later than the Magdalenian superimposed upon it tended to support this view, and a so-called Epi-palaeolithic or Azilian culture was envisaged. Later discoveries at many sites such as Campigny, Fère-en-Tardenois, Maglemose, and numerous widely distributed shell middens revealed the existence of cultures intermediate between the Palaeolithic and Neolithic, and led to the conclusion that the hiatus had no reality. The revelation of Azilian remains in Western Scotland, of Maglemose harpoons on the Yorkshire coast, and of microlithic industries in many districts appeared to bring Britain into line with the Continent in this respect. But this could not obliterate the marked differences between the typical Palaeolithic food gatherers and the typical Neolithic food producers. Chronologically it could not be denied that there was a considerable period of time between them, and it is to a detailed and critical examination of the industries of this time interval that the work under review is devoted. For this interval a definite term is desirable, and the author suggests Mesolithic. He prefers this to Epi-palaeolithic, often used, as it applies only to a part of the period, and to Transitional, because this implies an evolution more definite than can be shown to exist. Mesolithic then is simply a term, used to embrace the particular cultures that existed in point of time between the Palaeolithic and Neolithic ages. The author endeavours, though apparently not without some misgiving, to give an estimate of the duration of this Mesolithic interval which will probably not escape criticism. Placing the arrival of the Neolithic in Britain as late as the second half of the third millennium B.C. and the close of the Palaeolithic in the seventh, a duration of some four thousand years is obtained for the Mesolithic Age. Mr. Clark regards the Mesolithic not as a transition from Palaeolithic to Neolithic, but the Mesolithic and Neolithic as two civilizations diverging as separate branches from a common stem rather than as successive generations. Yet an element of continuity cannot be altogether ignored, but he makes the interesting observation that where contact between

Mesolithic tradition and the incursive culture of the food producers can be demonstrated it is with the Early Metal Cultures rather than the Neolithic that such a relationship is found to exist. This supports the view that our Neolithic was of very short duration.

Perhaps the most general feature of the Mesolithic Age is the presence of microlithic industries which have been found distributed throughout the world in a very remarkable manner, from Scotland to Australia, and from Poland to the Cape. In their minuteness, workmanship, and varied character these little implements are most intriguing. The author has given much time and study to their investigation, and his work is largely a detailed exposition of his critical examination of the microlithic industries that have been found in the many sites explored in Britain, illustrated in a clear and helpful manner by no less than sixty plates. Any detailed examination of his results would be out of place here; only the expert will fully and critically appreciate them. Suffice it to say that they are drawn from many districts, as the Pennines, Isle of Man, the Eastern Counties, South-West England, Wales, and Scotland, showing how widespread this culture was in Britain. There are several Appendices, one of which is very timely, for it is a thoroughly sane and scientific criticism of recent statements regarding the age of the Neolithic Flint Mines of Grimes Graves and Cissbury. The book is admirably produced, and is provided with two maps showing the distribution of sites, and a bibliography. The authorities for the evidence are fully quoted in footnotes. E. A. P.

MIDDLESEX IN BRITISH, ROMAN, AND SAXON TIMES. By Sir Montagu Sharpe. 2nd edition. *London: Methuen & Co. Ltd.* 1932. 9×6 *inches;* xx+240 *pages; illustrations and sketch-maps.* 15*s*

The first edition of this work appeared in 1919: the revision includes an extension of the chapter comparing Roman and Saxon land settlement, additional matter on place-names, and new maps. The matter set forth here, with enthusiasm and thoroughness, certainly seems to call for further investigation to determine whether Roman methods of rural economy and divisions of land were continuing at the time of the Domesday Survey. If this is to be answered in the affirmative views of early English economic history will require considerable revision.

The argument of a large part of this book depends upon the assumption that Caesar's crossing of the Thames was made at Brentford. Sir Montagu argues the case forcibly, basing his views principally upon the discovery from time to time of wooden stakes in that reach of the Thames. The case is strong, but it is not altogether impossible that, in the then state of the river, the Thames was fordable farther downstream. He makes no mention of the excavations carried out at Brentford in 1928, when the floor of a Roman-British hut on piles was revealed (see R. E. M. Wheeler's article in *Antiquity*, 1929). If these stakes were the piles of a "lake" village, and not part of a defensive pallisade, the argument for Caesar's crossing there seems to be somewhat weakened. G. R. C.

IRELAND. (The Blue Guides.) Edited by Findlay Muirhead. *London: Ernest Benn* 1932. 6×4 *inches;* lxxx+280 *pages; atlas, maps, and plans.* 12*s* 6*d*

No comprehensive guide to Ireland had appeared since the war before the publication of this latest addition to the Blue Guide series. The country is adequately covered by forty-nine routes, around which a great mass of practical detail and historical and archaeological information has been assembled. Where tested, the matter has been found up to date and trustworthy, and it is only occasionally that an amendment suggests itself. It seems a well-established convention that the traveller, apart from advice as to hotels, thirsts for historical data alone. In a

book dealing with a country where the topography is of such varied interest, a somewhat wider view might have been taken. In its own line however it is difficult to imagine this guide being superseded. With it, and a more general work such as Stephen Gwynn's 'Ireland' in the Kitbag Series, the traveller will be well equipped for his sojourn. G. R. C.

SCOTLAND. (The Blue Guides.) Edited by FINDLAY MUIRHEAD. Second Edition. *London: Ernest Benn* 1932. 6×4 *inches;* liv+454+32 *pages; plans and maps.* 12*s* 6*d*

SCOTLAND. By GEORGE HARVEY. (Harvey's Guide-Books.) *London: Humphrey Toulmin* 1932. 6×4 *inches;* 202 *pages; plans and maps.* 4*s*

THE GLORY OF SCOTLAND. By J. J. BELL. *London: George G. Harrap* 1932. 8×5½ *inches;* 404 *pages; illustrations and map.* 7*s* 6*d*

These three books would make useful and pleasant companions for any holiday in Scotland. The Blue Guide is business-like and informative. Mr. Harvey's Guide is as excellent as his guide to Belgium, and is particularly useful for its detailed treatment of roads, a feature which will be valued by motorists and walkers. Both books have been tested during a recent visit to Scotland, and it is difficult to find any serious matter for criticism. The Blue Guide, as one would expect from its price, contains better maps, but the black-and-white maps in the smaller book are clear and useful.

Mr. Bell's book is a volume to read at home or in the hotel before setting out on a day's excursion. Very little escapes him. As he says, Scotland, small as it is, is really a group of little Scotlands, each with its own peculiar characteristics, natural and human. The book is planned on these lines, and each section, each little Scotland, deserves a holiday to itself. Mr. Bell is at home with history, literature, and topography. He quotes Dorothy Wordsworth, Ruskin, Dickens, and Dr. Johnson, the latter somewhat sparingly. It is difficult to forgive the Doctor for a good many observations on Scotland, particularly his remarks on Loch Lomond, but he saw it on a rainy day. Mr. Bell deserves our thanks, if only for introducing his readers to Darnick Tower, near Melrose, where the traveller may view a typical Border Tower, not in ruins, but more or less complete as it was four hundred years ago, and still inhabited by the descendants of the man who built it. The description of Glen Coe is very moving: even in summer it seems a veritable valley of death. Mr. Bell tells the story of a traveller, overtaken at night in the glen, hearing the wailing of a child. He knocked at a cot, and when the shepherd came, cried: "There is a child——" "Ay, ay," said the shepherd, "there is a child, but you cannot be doing anything, for it has been crying since long, long ago." Mr. Bell's book is full of such touches. M. L.

THE SCENERY OF ENGLAND: a study of harmonious grouping in town and country. By VAUGHAN CORNISH. (*London*): *The Council for the Preservation of Rural England* 1932. 8½×5½ *inches;* 126 *pages; illustrations.* 3*s* 6*d*

In a short Foreword the Earl of Crawford and Balcarres introduced this little book as providing "a philosophic basis for the aesthetics of scenery, built upon the ultimate foundations of our geology and geography"; and the author in his Preface presents it as "a contribution to the aesthetic side of geographical science." Dr. Cornish's efforts in this new and very charming play of sidelights on geography are familiar to readers of this *Journal*. His latest book is written to serve the ends of propaganda for the preservation of rural England, but it is rare to find in the literature of propaganda a tone so remote from the coarse spirit of "boosting" and so full of the harmony which should exist between the physical and the human features of the countryside.

Dr. Cornish is not one of the fanatics who would arrest all progress in order to keep the face of the land as it was in earlier ages. He treats the works of men as part of scenery, and although his praise is usually for the old and mellow he recognizes that even such venerable structures as Windsor Castle and Hadrian's Wall were once crudely new and that they owe their present harmonious standing to the long result of time. In these calm and cheerful pages we miss with relief and gratitude the groans and tears so often drawn forth from the more hysterical lovers of rural England by the sight of arterial roads, pylons, and such marks of change. Dr. Cornish seeks for beauty to admire, not for ugliness to mourn over, and he finds beauty even in the industrial districts when seen from a proper viewpoint against a suitable background. He describes York Minster from a new angle, as seen from an aeroplane, and he acknowledges the aesthetic value of all visible objects that obviously fulfil the purpose for which they were designed.

The book consists of thirty-two verbal snapshots of the author's response to as many varying scenes of rural beauty grouped into six chapters and illustrated by eight appropriate photographs of his own taking printed in a pleasing sepia tint. Only one criticism occurs to us, and that, after all, is a tribute to the author's attunement to his theme: his descriptions reveal almost more of his own sympathetic appreciation of nature than of the geographical conditions which are the physical basis of beauty in landscape. H. R. M.

THE SCOTTISH MOUNTAINEERING CLUB GUIDE. The Northern Highlands. By W. N. Ling. *Edinburgh: The Scottish Mountaineering Club* 1932. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 88 *pages; illustrations and maps.* 4*s*

A new volume in the Scottish Mountaineering Club Guide series is always assured of a warm welcome from all climbers, and this section, which covers the country north of the Skye–Dingwall Railway, is of particular interest since it deals with a district consisting almost entirely of mountains and lochs. The author, himself a climber of note, gives us the benefit of his practical experience, and not only gives us details of the various climbs which will be studied by every expert, but discusses methods of approach to the hills on foot or by car, and the hotels in the locality. He divides his work into nineteen sections, devoting each one to a different group of hills such as the Coigach and the Torridon Groups, the Loch Maree Hills, Suilven, Beinn Dearg.

The illustrations are good and frequently of great practical value. With his description of the route up Beinn Eighe, for instance, the author publishes a photograph which has marked on it the different stages of the ascent, while there is also a view of An Teallach from Toll An Lochain where the important points are clearly marked. The book includes three excellent maps and an index and is very good value for money. It should be in the hands of every climber.

B. M. N.

DEVON: a survey of its coast, moors and rivers, with some suggestions for their preservation. By W. Harding Thompson; for the Devon Branch of the Council for the Preservation of Rural England. *London: University of London Press* 1932. $12\frac{1}{2} \times 10$ *inches;* xx + 144 *pages; illustrations and maps.* 21*s*

The nation cannot afford to lose the beauty of Devon, but its preservation is a complex and difficult matter, in which have to be balanced the interests of the native and the visitor, of the many and the few. This handsome volume offers a valuation of local features it is desirable to preserve and protect against glaring incongruities and disfigurements. "The real way to see Devon," writes Sir J. Fortescue, in an eloquent preface, "is from the saddle"; but it is the day of the motor car and of a tourist traffic dependence upon which is demoralizing to

a population, and which makes it "difficult to preserve the old comeliness of road and village in Devon." The Devonian has a goodly heritage; his problem is how "to pass it on unspotted to those who come after us." The author, who has prepared a similar survey for Cornwall and assisted in that of the Thames Valley, has ably presented his case in two parts, first, a survey of towns and villages, coastal tracks, rivers, and bridges, moors and antiquities (Plymouth and Exeter are omitted because both are committed to statutory planning schemes); and second, suggestions for the future, which may be of use to authorities when they prepare their schemes. The text is fully illustrated with plates, plans, and maps. Good as is Part I, the chief value of the book resides in Part II, the conclusions drawn from the survey as to methods of preservation, *e.g.* of areas of special landscape value (Chapter V and map 5), and of roadside amenities, and as to means of preventing disfigurements. A summary of recommendations is found in Chapter X. The need for planning with long foresight is especially exemplified in the growing coastal resorts where new buildings suggest little of Devonian tradition. New architectural forms are of course inevitable, but, as the author points out, much may be secured if the importance of harmonious colouring is realized. An initial mistake in planning was the planting of gasworks between Torquay and Paignton on "the sea front of Devon's finest bay." It is a common cause of bitterness that the public is so often debarred from the ancient uses of coastguard tracks when small properties take the sea frontage. A right of way adjacent might gracefully be conceded by owners of cliff lands. S. E. W.

LA FRANCE: SON VISAGE, SON PEUPLE, SES RESSOURCES. (Introduction by JACQUES BAINVILLE.) By ERNEST GRANGER. *Paris: A. Fayard & Cie* 1932. 9 × 5½ *inches; 432 pages; maps.* 25 *fr*

A popular geography, obviously not intended for the advanced student, M. Granger's France is an admirable example of the French genius for geographical description. "Un poème géographique," says M. Jacques Bainville in his foreword. One is not tempted to accuse the author, as he appears to apprehend, of a tendency "de voir les choses trop en beauté," his descriptions are too just and apt for that, though from time to time he falls into that "Narcissus" attitude so common in French writers as they contemplate the features of their native land. "Nous voudrons témoigner," he writes, "du contentement profond que procure le seul fait d'exister et de respirer dans ce pays."

One-third of the book is devoted to a description of the natural regions of France. Probably no geographer feels very happy in defining the term "natural region," and there can be none who have not experienced great difficulty in the delimitation of such. M. Granger, it appears to the writer, further complicates the matter by introducing the historical factor in making his divisions; for example, one cannot feel that much is gained by ignoring the violent contrasts in the life and activities of the people of the various parts of Normandy, so closely related to contrasting physical conditions. Passing from Provence round the Central Massif, the author presents a series of rapid brush sketches, which, though lacking in precision of outline, rarely fail to convey a colourful impression of the landscape which forms the background of the lives of the people. Touching here and there on essential features of relief and climate, the author never allows his flowing description to be interrupted by prosaic explanation. The geographer to whom a thorough understanding of the physical basis is essential to an appreciation of a natural region, will, of course, not be satisfied by the ignoring of his questions as to why and how. If he be already well informed in that respect he will find much that is suggestive and interesting.

A section entitled "Les hommes" deals briefly with the origins of the French

people, the foreign element in the land, density and distribution of population, migration, language, and dialect. Perhaps the most valuable part of the book is the last section, which deals with the economic life of France. The subject is treated in the main historically. Here again the author is content with a picturesque recording of facts and conditions; there is little or no correlation or explanation, but the essential facts of present conditions are picked out as unerringly as are those of the landscape in the former section.

There is a useful set of statistical tables in the appendix, and the maps are simple and clear. The author provides a bibliography, but no index. H. O.

DE TARENTAISE EN MAURIENNE. By ANDRÉ-CHARLES COPPIER. *Chambéry: Librairie Dardel* 1931. 13×10 *inches;* 110 *pages; illustrations* (by the Author)

The author, who is also a distinguished artist, writes with intimate knowledge of a district not perhaps well known to tourists. This part of Savoy is inhabited by a sturdy race of peasants who are great breeders of cattle and mules. In the higher districts they still wear their national dress which figures largely in the illustrations. For the rest, the general impression is one of almost savage wildness, of little terraces of earth laboriously, even dangerously, cultivated; of glaciers, mountain torrents, and eternal snows. The pictures bring out the sturdiness, independence, and piety of these mountain people, and are beautifully reproduced. M. L.

PORTUGAL AUF GRUND EIGENER REISEN UND DER LITERATUR. By Dr. H. LAUTENSACH. I Teil. Das Land als Ganzes. (Petermanns Mitteilungen: Ergänzungsheft Nr. 213). *Gotha: Justus Perthes* 1932. 11×7 *inches;* 214 *pages; maps and profiles. M.*20

Portugal, says Dr. Lautensach, is one of the least-known parts of Europe. He has spent nine years in investigating its geography, both by personal visits of considerable duration and by a conscientious examination of the literature. The results of his research are to appear in two parts of which the present forms Part I. It deals with the general geography of the country and has a double basis, personal observation and examination of source material being combined with critical comments on the observations and deductions of others. Part II is to be devoted to the separate elements of the country and is to be based mainly on the material gathered during the author's journeys. To it pictorial illustration is to be relegated, while the present part contains a number of maps, some coloured (many of the uncoloured maps are unfortunately so much reduced as not to be very easily legible), as well as many useful statistics.

This brief summary indicates both the value of the work and the fact that the author in the present part has somewhat handicapped himself by the method adopted. Of the latter fact indeed he appears himself to be conscious, for he states his opinion that the time has not yet come when it will be possible to give a complete account, along modern lines, of the geography of Portugal. This means that his work lacks that direct appeal which can be made by an author who feels that he has completely mastered his material. There is however more than this, for the reader is apt to be conscious of a certain incompatibility between the two aims pursued. To be able to follow with interest a critical examination of the existing literature demands a knowledge of that literature hardly less than the author's own, and further does not attune the reader to the receptive mood necessary for the sympathetic consideration of his own observation and deductions. The difficulty is increased by the fact that the critical element predominates in some of the earlier sections while the later rather present facts either new in

themselves or in the correlations established. To most readers it is these sections which will seem especially valuable. Particular mention may be made of the accounts given of the effect on Portuguese rural economy of the sixteenth-century introduction of "colonial" plants, notably the kidney bean, the potato, and maize, and of the present place of maize among the crops of the country. The careful surveys of the livestock industry and of the causes to which its special features are due, and of the distribution of population, are also of much interest. Generally the author's strength may be said to lie in handling details, themselves obviously collected by persevering and long-continued effort. Some of the criticisms of the publications of others seem to ignore the fact that the authors concerned were often dealing with a larger area than Portugal, and had necessarily to generalize about that country, especially in view of the fact that details in regard to it have hitherto been difficult to obtain.

Generally then the book is not and does not profess to be the final word on the geography of Portugal. But it represents the fruits of long years of patient research, contains much invaluable material, and brings the possibility of an authoritative general survey of this interesting borderland country many stages nearer. For all these reasons the book must not be overlooked by geographers here, who will look forward with interest to its completion by the publication of the second part. M. I. N.

CONTEMPORARY ROUMANIA AND HER PROBLEMS: a study in modern nationalism. By JOSEPH S. ROUCEK. *Stanford (California): University Press; London: Humphrey Milford* 1932. 9×6 *inches;* xxvi+422 *pages; illustrations and maps.* 22*s* 6*d*

As his title indicates, Professor Roucek's book is not intended primarily for the geographer. In his preface he describes it as an attempt to explain the basis of Romanian life and politics, and Part II, entitled Political Life, forms the largest single section of the book. Part I, Historical Development, does not include even a brief summary of the geography of the country, nor do the three somewhat rough sketch-maps throw much light on this subject. On the other hand the section on Economic Romania includes a lengthy chapter on the Economic Geography, with a large number of statistical tables, while there is also a full treatment of Agrarian Reform, a copious bibliography, and a fairly full index.

Despite the amount of statistical matter however it is not easy to extract from the economic section the actual facts even in regard to such a relatively simple matter as agricultural production. The tables have been taken from a variety of sources and are expressed in different, sometimes (p. 305) even in unspecified, units, so that their correlation is difficult and sometimes impossible. Nor do headings such as "pre-war average" (p. 255), no years being mentioned, inspire confidence. There is also much repetition and the style frequently shows an irritating inelegance. Thus, while the author has collected a large amount of material, much of which will doubtless be of value to those for whom the book is intended, the geographer will not, we think, gain much from its perusal.

There are a number of illustrations, including portraits of many of the leading personalities of present-day Romania. M. I. N.

ACROSS LAPLAND, WITH SLEDGE AND REINDEER. By OLIVE MURRAY CHAPMAN. *London: John Lane* 1932. 9×5½ *inches;* xiv+212 *pages; illustrations and sketch-map.* 15*s*

Even in these days it is something of an adventure to travel through Lapland, and the undertaking demands pluck and determination of a high order. Mrs.

Murray Chapman is not wanting in these qualities, and she also possesses another qualification which not all travellers exhibit—the power of making herself liked by those she meets. Thus, in spite of her ignorance of the languages, she was able to make considerable contacts with the Lapps she met or visited. Her journey took her, *via* Hammerfest, to the Lapp Market at Bossekop, and thence to Karasjok, Kautokeino, Karesuando, and home by Kiruna and Narvik. She thus came into touch with the Lapps of Norway, Sweden, and (to a small degree) Finland. Her account of her experiences makes excellent reading, and is illustrated by the numerous photographs that are reproduced and by her sketches which bring out the wild beauty of Lapland's winter landscape. As an artist she was particularly impressed by the Lapps' love of colour, shown especially in their gay clothing. She has much to say about the daily life of the people as she saw it, and, like a good traveller, she missed no opportunity of being present at weddings, church services, and parties. She learned to drive a reindeer and had an unpleasant adventure with Lapp dogs. She was equipped with a camera which enabled her to film a good many of the persons and things she saw. While the Lapps continue to live a life of great hardship and adventure—and Mrs. Chapman herself experienced some of the climatic rigours in a severe form—yet one cannot fail to be struck by the way in which material civilization has penetrated into parts of the country as a result of the efforts, educational and otherwise, made by the Norwegian and Swedish governments. A. R. R.

AFRICA

CONGORILLA: adventures with pygmies and gorillas in Africa. By MARTIN JOHNSON. *London: George G. Harrap & Co.* 1932. 9×5½ *inches;* 236 *pages; illustrations and sketch-map.* 12*s* 6*d*

This is a record of hunting with a camera chiefly in the forests of the Belgian Congo. The mountain gorilla is the central figure of the narrative. He lives in the dark and dripping forests on the flanks of that mountain group which lies to the west of Lake Edward and Lake Kivu. His habitat does not lend itself to photography. Not only is he so hidden in the sunless vegetation that an occasional view is all that can be had of him, but there are in addition numerous technical difficulties caused by the damp and warmth of the atmosphere. Only a master of his craft, like Mr. Martin Johnson, could achieve success in so unfavourable an environment. He describes to us his varied difficulties and the devices employed for overcoming them. In addition he has much to tell of the habits of gorillas and of his adventures at close quarters with them. Perhaps the most pleasing statement in his narrative is that which refers to the gorilla population. He thinks that it is much larger than hitherto believed, and suggests that there may be 20,000 of these apes existing on the mountain range. At present the animal is in no danger of extinction. The Belgian authorities have secured this by the establishment of the Parc National Albert. R. W. G. H.

THE ANIMALS CAME TO DRINK. By CHERRY KEARTON. *London: Longmans, Green & Co.* 1932. 8×5½ *inches;* 190 *pages; illustrations.* 6*s*

We have here a narrative of wild life, not the usual account of each species with its habits, but a work of fiction founded on observation, and confined exclusively to the animals themselves. There is no human character in the story. The animals live their lives before us, and the reader is led to share in their experiences. He is made to understand how they struggle for food, escape enemies, battle with rivals, maintain territories, meet the calamities of fires and locusts, and

many other happenings that occur in their lives. Though a work of fiction, it is true to nature. There is in it none of that distortion of fact which of recent years has been so common both in books and films. It gives a truthful and vivid impression of the fears, alarms, excitements, and tragedies that fill the life of the African wilds. R. W. G. H.

GEOLOGICAL SURVEY OF UGANDA. (Memoir No. 2.) The Geology of South-West Ankole and adjacent territories, with special reference to the tin deposits. By A. D. COMBE; with an appendix on the petrology by A. W. GROVES. *Entebbe, Uganda* 1932. $10\frac{1}{2} \times 8$ *inches;* xiv+236 *pages; illustrations and maps.* 35*s*

Although essentially a book for those interested in the geology of Uganda and its tin deposits, this memoir deals succinctly with the history of the changes by which the present surface features have been brought about. South-west Ankole and the Bukoba Province of Tanganyika Territory are described in detail and the geography can be treated as a whole. The Karagwe-Ankolian sediments, their distribution, age, and conditions of deposition are fully described, but the greater interest begins with the close of the Cretaceous period when, following "a long cycle of denudation and tectonic quietness," uplift and warping disturbed the peneplain thus produced and initiated the present topography. Evidence is found for two and perhaps three peneplains, the third having been formed about, or rather before, the beginning of the Miocene, and it is also in the early stage of the same period that the development of the Rift depression is believed to have begun.

By intermittent movement the formation of Lake Victoria and the Western Rift, the breaking-up of the westerly flowing drainage then rising to the east of the future lake, the development of secondary watersheds and in some cases a reversal of drainage were produced. The history has more than a local interest. The "Arenas," which we have learnt to associate with Uganda, and their origin as domes or pitching anticlines partially caused by the inflow of granitic magmas during folding, are described. The economic side of the geology occupies an important part of the book. A key-map showing the distribution of the Karagwe–Ankolian System is given; it would be easier for the general reader, who wishes to grasp one aspect of the subject, if more names could be added to it, even if the size of the map had to be increased. One feels occasionally rather lost, and the "Index grid" for locating place-names hardly meets the difficulty. The contoured, coloured geological maps, the plates, photomicrographs, and sections deserve the highest praise. Dr. Groves contributes an Appendix on the Petrology, Mr. Simmons "Postscripts," and three indices complete the book. J. P.

NORTH AMERICA

ONE HUNDRED YEARS IN YOSEMITE. By CARL PARCHER RUSSELL. *Stanford (California): University Press; London: Humphrey Milford* 1931. 9×6 *inches;* xvi+242 *pages; illustrations and sketch-map.* 20*s*

The establishment of the National Parks is one of the most remarkable achievements of the United States. Government museums and libraries have been founded in the Parks and serve as repositories of manuscripts, which concern the history of these regions. 'One Hundred Years in Yosemite' is based "upon the story told by the Yosemite Museum history collection and is published with the approval of the National Park Service." Mr. C. P. Russell traces the history of the discovery and development of the Yosemite region during the past hundred

years. It seems to be certain that "the first inkling of the existence of the Yosemite Valley" was the result of a journey made in 1833 by J. R. Walker, when he was in command of a section of Captain B. L. E. Bonneville's expedition. The gold rush of 1849 resulted in a more detailed exploration of the area. The book contains descriptions of the difficulties of early transport, the history of the Yosemite hotels and their keepers, and the history of the administration of the Park, since its creation as a "reserved forest land" in 1890. A full bibliography of works dealing with the history of Yosemite and a number of interesting illustrations make the book a useful addition to the history of the Sierra Nevada.

E. W. G.

THE GRAND COULEE. By J. HARLEN BRETZ. *New York: American Geographical Society* (*Special Publication No.* 15) 1932. 10×6½ *inches;* x+90 *pages; illustrations and maps.* $4.00

This study of the Grand Coulee of the Columbia Plateau in Washington is well produced and excellently illustrated. It is, in fact, a scientific paper published as a book. The author describes the area, considers views which have been put forward from time to time to explain this great canyon, and then gives an account of his own ideas. He regards the canyon as cut by water, much in the same way as the receding Niagara Falls have cut, and still cut, the Niagara Gorge. But the Grand Coulee is on a far greater scale, and, as he asks in his preface, "Can we think favourably of a vanished cataract more than seven times the width of Niagara and more than five times its height?" The author fully realizes that his hypothesis is open to question.

The memoir is well worth reading, and if the author leaves the reader rather uncertain, well, so much the better. Natural phenomena are not always susceptible of easy explanation, and in the reviewer's opinion the author has done well to show that uncertainty exists.

J. A. S.

CANYON COUNTRY. By JULIUS F. STONE. *New York and London: G. P. Putnam's Sons* 1932. 9½×6 *inches;* xvi+442 *pages; illustrations and map.* $5.00 (£1 5*s*)

This book is difficult to review adequately. It is not a text-book, and it is not an ordinary account of travel. The author has written his experiences in diary form, and this section of the book occupies but little space. He has, as he frankly acknowledges, practically borrowed a chapter from Dutton's well-known 'Tertiary History of the Grand Canyon District,' and this serves as a very good geological introduction. The bulk of the book consists of a series of about three hundred excellent photographs with short but useful descriptions. Few books can contain such a beautiful collection of pictures, and pictures of real physiographical value.

Geographical libraries will be the richer for possessing this volume, and the student should gain much by a careful perusal of the notes and intent study of the plates.

J. A. S.

CENTRAL AND SOUTH AMERICA

LITTLE-KNOWN MEXICO. By MARIAN STORM. *London: Hutchinson & Co.* 1932. 9×5½ *inches;* 288 *pages; illustrations and sketch-map.* 12*s* 6*d*

A book is not always true to its title, but the author of 'Little-Known Mexico,' who is an American, has certainly visited many of the smaller and more remote towns of this interesting country, and eschewed all mention of those which have often been described. Her journey is illustrated by a sketch-map; with various detours she travelled from Tampico to Guatemala, a country which she found

excessively expensive; then again, from Mazatlan, on the west coast of Mexico, to Guadalajara, Pátzcuaro, and, finally, to the place she liked above all others, Uruapan. There are excellent descriptions of the oil-bearing districts, of the caves of Cacahuamilpa, of the Guatemalan frontier, and of the "paradise of Machaochan." Interspersed with these are many amusing incidents of the lives of the people.

The book reads rather like a novel, and suffers somewhat from over-emphasis and repetition, but the author is a keen observer and has a gift of vivid description that makes the reader feel the interest and reality of the places and incidents of which she tells. The chapters are short but complete, so that the volume is a pleasant one to linger over, and several good photographs enhance its value.

A. W. S.

MY JUNGLE BOOK. By HERBERT SPENCER DICKEY. *London: Hutchinson & Co.* 1932. 9×5½ *inches;* 286 *pages; illustrations.* 12*s* 6*d*

'My Jungle Book' is well named. Its first chapter deals with the art of exploration, and we learn that the stunt expedition is led by a man who usually possesses several degrees from learned societies. "The British degrees which might conceivably be held are F.R.G.S. which . . ."; we go on to build-ups, ballyhoo, high-grade ethical publicity, and other arts. The second chapter speaks ill of missionaries, the third of French investors and engineers in South America, the fourth of a Venezuelan. The fifth is about museums and monkeys, the sixth about the subterranean methods of the U.S. Department of State, and General Grant and his designs on the Dominican Republic. By Chapter VII we come to Columbus, who put on the map America and the mouth of the Orinoco, and to the author, who "finally attained its long-sought-for source in 1931," but switches off to a life of the President of Venezuela. Chapter VIII is about Indians of the Plains. Chapter IX compares graduates of American Universities unfavourably with Maquiritari Indian boys. Chapter X is about ghosts at San Fernando de Atabapo; the next about smallpox and the disadvantages of radio which sends sermons instead of messages; and so on, until at last we are told in the seventeenth that Dr. Dickey discovered the source of the Orinoco on 14 July 1931, though p. 278 shows only that they got up the river as far as they could and returned. The author claims that the source in the Parima Mountains is many miles east of where "the mapmakers" had located those mountains. But he gives no figures, nor any evidence that he had observed a longitude, and so we are not much better off in the end than if he had been a stunt explorer himself.

AUSTRALASIA AND PACIFIC

AUSTRALIA: Human and Economic. By ARTHUR JOSE. *London: George G. Harrap & Co.* 1932. 9×6 *inches;* 332 *pages; illustrations and maps.* 10*s* 6*d*

The preface makes it clear that this work is intended mainly for inquirers in this country. In the historical part of it however the author shows no undue care for the susceptibilities of English readers, and this may sometimes lessen the effect of much of the good advice he gives to them. It would be unprofitable to point out instances in which the book suffers from a slightly hostile attitude towards "Britain," but it seems permissible, with regard to the statement that "Australians who had been through the fighting did not return with any very high opinion of British troops or the British people," to say that this is not the opinion of the writer of this review who got to know intimately many Australians in

Australia in the years after the war and spoke freely with them. Nor is it the view of an eminent Australian soldier and statesman to whom he referred the passage.

It would be a pity if this—by no means invariable—attitude of the author deterred any one in this country from profitably spending the eight to ten hours required for reading Mr. Jose's work and from thereby getting a good knowledge of the history, sociology, physiography, and economic developments of Australia. The work is divided into four parts under these headings. Unfortunately the physiographical chapters in Part III which should be of most interest to geographers are the least well done. The account they contain of the geographical features deals first with the coastal regions, starting in the south-west and going round the continent, keeping the interior on the left hand; and then very briefly with the wide inland regions—the western peneplain and the alluvial areas lying to the east of it. The natural features as well as the human creations in the form of towns, harbour works, and railways, and the results on the land of irrigation, agriculture, mining, and industry are passed in review, but without a map of Australia spread out before one it is not easy to follow these descriptions, and there is no good map in the book. There are half a dozen sketches of districts on different scales inserted in the text but they do not make a continuous series and do not appear to have been prepared or adapted to illustrate the pages to which they refer; they omit many names there included and contain many not there mentioned. Illustrative maps would also have been of value in making clear the text of other parts of the book; for instance, the account of the road and railway construction in the valuable chapter on self-government. It is fair however to call attention to the statement in the preface that "the actual geographical and climatic facts are dealt with, not for themselves, but as explaining how by their influence the Australia of to-day—flora, fauna, and human population alike—has assumed its present shape and differentiated itself from the outside world," and it is also fair to add that the author goes a long way to carry out this useful intention.

The most important sections of the book are Parts I and II, dealing with history and sociology. In the former the chapter on self-government describing the development of the land and the fiscal and communication policies of the separate States, makes clear many of the difficulties in the creation of the Commonwealth and to some extent explains the form it took in 1900, namely, a federation rather than the unification that had been adopted in the Dominion of Canada, to which earlier form there was reversion in 1910 when the Union of South Africa came into existence. The author allows it to be seen that he favours greater power being given to the Federal Government. Other predilections that he evinces are for high protective tariffs to enable secondary industries to be created and developed, and for such socialist principles of government as will effectively prevent undue dominance by landed or money interests.

Particular attention should be given to the well-thought-out chapter on Relations with the Empire which are treated under the headings of foreign policy, tariffs ("a stumbling-block in the variety of imperialism chiefly cultivated in Britain"), and immigration. On the last question Mr. Jose's pronounced views seem thoroughly logical. If anything, when arguing against the power of Australia to absorb a large immigrant population, he rather under- than over-states his case. To those who know the high proportion of "light-carrying" grazing country in Queensland it is difficult to believe that "quite a third of its area is fit for closer settlement." With his advocacy of the white Australian policy, few people will now quarrel. There can be little desire to add to the instances in which the introduction of a servile population for the supposed benefit of a proportion of

the white settlers has led to a restriction in the freedom of the people introduced and so to injury both to them and to their masters.

So ardent an Australian as the writer of this book cannot but regret the failure of its illustrations—except the photographs of the animals—to convey anything of the special beauties of the country. Probably this, as well as the inadequacy of diagrams and maps, could not be avoided without making the book expensive, and so less accessible, and that would have been a pity. M. N.

THE CALL OF THE SOUTHERN CROSS. By A. S. N. WADIA. *London: J. M. Dent & Sons, Ltd.* 1932. $7\frac{1}{2} \times 4\frac{1}{2}$ *inches;* xiv + 144 *pages; sketch-map.* 6*s*

This book is the work of a scholarly Parsee, observant, well read in history, and an ardent supporter of the "grand Imperial Scheme of Things." It was natural therefore that in his four months' tour of Australasia he should be interested in subjects such as the growth of a distinct Australian nation within the Empire, and the treatment of the Maori in New Zealand. It is to be regretted that instead of developing such themes he should have dwelt so much upon the commonplaces of travel. There emerges from this slight sketch however a pleasant personality, naïvely humorous, sympathetic, and somewhat idealistic.

G. R. C.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

HANDBUCH DER KLIMATOLOGIE. By JULIUS VON HANN. Fourth edition, revised by KARL KNOCH. Band I. Allgemeine Klimalehre. *Stuttgart: Engelhorn* 1932. $9 \times 6\frac{1}{2}$ *inches;* xvi + 444 *pages. M.*24.50

Twenty years have elapsed since the appearance of the third edition of Hann's Handbuch, which has been the accepted authoritative treatment of the climatology of the globe. A new edition of the first volume, edited and revised by Professor Knoch, will be regarded as an event of note by all students of climatology. The work of revision, a formidable task, has been carried out with care and thoughtfulness. Hann's book was distinguished from others on the subject by the emphasis which it laid on what may be called the purely geographical aspects of climate, and this emphasis has been preserved by Professor Knoch, though the book has been very largely rewritten, in order to take account of work done in the last two decades.

The chapter on the climatic elements, temperature, humidity, precipitation, clouds, wind, and pressure, follows closely the lines of treatment in the third edition, but radiation is discussed more fully, both here as a climatic factor, and in the second part of the volume, under the heading of Solar Climate. Part III, Land and Sea Climate, follows closely the text of the earlier edition. Here we find a clear discussion of the climatic differences between land and sea; radiative effects upon the surface, the interchange of heat between the air and the Earth's surface, the effects of the nature of the surface on diurnal and annual variations of temperature, the influence of the land on wind, humidity, and precipitation being considered in turn. This part covers seventy-five pages, all crammed with information, and, it must be added, the most recent information.

Part IV, High-level Climate, has been more drastically revised than the earlier parts of the book. A discussion of variations with height of incoming radiation and a comparison of meteorological conditions on mountains with those in the free air at the same level are followed by a discussion of the influence of mountains on meteorological factors, and of limits of snow and glaciers. This part contains also a new section on climatic height zones. Part V, Climatic Zones, has been increased by the addition of an appendix giving Köppen's classification of

climates. Part VI, Changes of Climate, deals with the vexed questions of periodic and secular changes in climate, and the climate of prehistoric times. These are topics upon which agreement has not been reached, and seems still distant, and Professor Knoch is to be congratulated upon the care with which he has collected the salient references.

The volume before us maintains the high standard set by its original author. Its comprehensive treatment and voluminous references to original papers make it indispensable to all serious workers in climatology. The mass of information which it contains can only be described as amazing. In view of this it may be ungenerous to say that the references to recent work are mainly to papers in German. In conclusion the reviewer would congratulate Professor Knoch on the skill and care with which he has accomplished a heavy task. D. B.

CLIMATOLOGIA. By LUIGI DE MARCHI. Second Edition. *Milano: Ulrico Hoepli* 1932. 6×4 *inches;* xiv+290 *pages; maps.* L.15

Professor De Marchi explains the appearance of a second edition of this little book after the lapse of forty years by the large amount of fresh data since accumulated. The book draws a proper distinction, not always observed in text-books, between the factors and elements of climate. We sympathize with the author's expressed difficulty in compressing into a small space the mass of new material furnished by Köppen's standard works and other sources, though this difficulty hardly acquits him of occasional inaccuracies, particularly in regard to vegetation, which he uses as an index of climate. Thus, to say that in the British Isles wheat is chiefly grown in the east and south of England would have occupied no more space than to say that it only ripens in the London Basin: an error even on a much wider conception of the geographical limits of that basin than is ordinarily held in England. L. C. W. B.

THE LAST CRUISE OF THE *CARNEGIE*. By J. HARLAND PAUL. *Baltimore: The Williams and Wilkins Company* (*London: Baillière, Tindall and Cox*) 1932. 9×6 *inches;* xviii+332 *pages; illustrations and map.* 26*s* 6*d*

The *Carnegie* was a non-magnetic wooden hermaphrodite brig with a bronze auxiliary motor, built in 1909 by the Carnegie Institution of Washington to carry on the investigation into terrestrial magnetism and atmospheric electricity which had been initiated on board the *Galilee* in 1905 by the Institution's Department of Terrestrial Magnetism. Her first six cruises, between the years 1909 and 1921, had been devoted almost entirely to these subjects. The seventh cruise included a large programme of oceanography and was intended to last three years. The book under review is a narrative for general reading written by the surgeon, J. Harland Paul, who was also one of the observers in oceanography. It is illustrated by numerous photographs and the methods and instruments are described, so that it should be of interest to the non-scientific reader.

The commanding officer was James Percy Ault, who had been on the staff of the Department for twenty-five years and had commanded the ship on three previous cruises, including the one in which she circumnavigated the Antarctic continent in a single season, making only one call, at South Georgia. The scientific staff numbered eight, and the programme of work to be done was so large that it was only by using many automatic recording instruments that they could carry it out and compute the results at sea. It was because they were so computed and sent home from every suitable port that the cruise was a success in spite of its tragic end. The *Carnegie* left Washington on 1 May 1928 and cruised first in the North Atlantic, visiting Plymouth, Hamburg, and Reykjavik. Then she passed through the Panama Canal for her work in the Pacific; the low power of

her motor, which was unavoidable, caused considerable delay when proceeding out of the Gulf of Panama. Once clear she made a great loop in the south-eastern Pacific, touching at the Galapagos Islands and Easter Island, and cutting the Peru Current twice. Next course was set to the westward, and she visited Japan and returned eastwards to San Francisco on a track which took her nearly to the Aleutian Islands. From San Francisco she proceeded to the Hawaiian group, where the staff had the unusual experience of twice seeing a seismograph dismounted by earthquakes as they watched. Then, after an eastwards loop, course was set for Samoa, where she was destroyed by a petrol explosion, with the loss of her commanding officer and the cabin boy. The rest of the scientific staff were on shore; otherwise the disaster might have been even greater than it was.

D. J. M.

MERS ET OCÉANS. By CAMILLE VALLAUX. (Bibliothèque générale illustrée. No. 21.) *Paris: Editions Rieder* 1932. 8×6 *inches;* 100 *pages; illustrations and sketch-maps.* 20 *fr*

This little popular book on the sea is remarkably well illustrated by sixty plates, reproduced from photographs and nearly all good technically and well chosen. They illustrate many aspects of the subject: waves, shores, coastal erosion, corals, fisheries, shipping, and seaports. The aerial views of seaports and the series showing surf breaking on beaches and seawalls deserve special mention. The plates are not described in the text, but in a "Table des Planches" at the end, which should not be overlooked.

Unfortunately, the text falls short of the illustrations, being misleading and often absolutely inaccurate. Two examples may be quoted. It is stated that the discontinuity layer (the *Sprungschicht* of German oceanographers) is the zone, generally between 800 and 1500 metres, at which the temperature tends to stabilize itself in the region of 4° C. And the vertical circulation of the ocean is illustrated only by a sketch which shows warm water concentrated to high density by evaporation (under the equator ?) sinking to the bottom and rising to the surface again at the sides, cooled by its vertical journey in great depths. The progress of oceanography during the last thirty years is completely ignored.

D. J. M.

CARTOGRAPHY

GEODETIC TRIANGULATION. By Captain G. BOMFORD. Survey of India. Part I of the Handbook of Professional Instructions for the Geodetic Branch (Third Edition). Published under the direction of Brigadier R. H. THOMAS. *Dehra Dun* 1931. 10×6 *inches;* viii+110 *pages; illustrations and map.* 2 *rs.* 8 *annas* (4*s* 6*d*)

This official publication of the Survey of India is a detailed description of the methods which are being employed by that body in carrying out their Geodetic Triangulation. The effect of the book is not so much that of a text-book as of a series of rules and regulations; but, lest any who have had experience of "books of regulations" should misjudge its value, it should be said at once that each regulation is explained fully, reasons for it are given, and the examples and illustrations provided succeed in making it a most valuable book of reference to trigonometrical observers and computers, not only in India but in any part of the world. It is of a convenient size to carry around in the field, well printed and well arranged, and covers the subject with great thoroughness. For this very reason it is to be deplored that no index has been provided.

The book falls naturally into two parts: the observations in the field, and the

subsequent computing in the office. In the former the author has nothing very new to say, and indeed it is to be doubted whether there is anything very new which can be said, but it is equally true to say that there is very little of value, either in a practical or theoretical sense, which he has left unsaid. The short sections on the Rejection of Observations and The Analysis of Graduation Error of a 12-inch Theodolite are of particular interest.

The sections on computing are clear and logical, and it must be remembered that it has been the author's task to provide a handbook descriptive of definite and established custom and not to assume responsibility for the methods employed. Although there is, perhaps inevitably, a certain amount in the examples of the computing forms at which one would like to cavil, it must be remembered that these forms are designed for a special purpose and for a special type of computer, and if they fulfil their object, as presumably they do, those who are not acquainted with the exact conditions of the problem are in no position to criticize. In any case it has been the writer's experience that on few subjects so strongly as on computing forms do individual opinions differ, and differ so extensively. However, Form No. 30 (Computation of Latitudes, Longitudes, and Reverse Azimuths) provides an example of the way in which computations are arranged. An effort, and a very successful effort, has been made to make the computations foolproof. Any one who can use geodetic tables should be capable of obtaining the correct answer. This is a valuable point where native computers are concerned, but still it should not prevent the formula which is being computed being set out at the head of the form.

At the same time however there is a good deal of scope for that mental arithmetic involved in adding in one's head two sets of figures occurring in different portions of the form, which is so productive of arithmetical slips unless the figures are abstracted on to a slip of spare paper. This is in practice seldom done; it involves both extra trouble and perhaps a tacit admission of mental inferiority, neither of which commend themselves to the average computer. As a matter of interest the writer has attempted from Form 30 an analysis of the principles underlying this computation. The general method of attack appears at first sight to be very similar to Puissant, whose formulae, as elegantly modified by Everest, were formerly accepted as the standard method of dealing with this problem in India and elsewhere. It appears however as if India had added a recruit to the many ways already existing of working this problem. It seems that Clarke's geometrical method is undoubtedly superior, but for the reverse problem the formulae of Gauss must hold the field. These formulae are quite good for lines up to 20 miles, in which case the third order terms may be omitted without essential error, even for the direct problem. For lines over 25 miles Gauss cannot compete with Clarke, nor, it is feared, can the Survey of India.

Perhaps the fairest remark one can make about this book as a whole is to say that when an official copy "for perusal and return" came to the writer, he took immediate steps to secure another copy for his personal use and retention.

J. C. T. W.

MAPS AND MAP-WORK. By J. W. CAMERON. (Harrap's New Geographical Series.) *London: George G. Harrap & Co.* 1932. $7\frac{1}{2} \times 5$ *inches;* 146 *pages; illustrations.* 2s

This book is nicely printed in Baskerville type and has a general air of intelligence about it: so that teachers may find it suggestive. But they must not use it unless their knowledge is more accurate than the author's, to detect and avoid his many mistakes. For example, his explanations of the semicircular protractor (p. 22), of the simple conical projection (p. 31), of Mercator's projection (p. 42), of spot

heights (p. 52), of the Magnetic poles (p. 59), of compass graduation (p. 86) are dangerously misleading; his construction for the conical projection with two standard parallels (p. 37), his definition of local mean noon (p. 104), his method of map setting without a compass (p. 111), his unqualified statement that "In the northern hemisphere the sun approximately rises east and sets west" (p. 101), and that "on the latest maps any vertical sheet line is a true meridian (p. 111) are all wrong. Such a book should never have been passed for inclusion in a New Geographical Series. A. R. H.

ECONOMIC AND HISTORICAL GEOGRAPHY

RALEGH'S LAST VOYAGE. By V. T. HARLOW. *London: The Argonaut Press* 1932. 10½×7½ *inches;* viii+379 *pages; portrait and maps.* 30*s*

The story of Ralegh's last expedition provides a stringent test of the qualities of the historian. The evidence is bulky, and yet not altogether of the nature to be desired. Some vital points are obscure, and on others the information is too ample, for it comprises statements that contradict one another. Hardly one person concerned in the venture can be described as an honest and straightforward man, certainly not King James, not Ralegh himself, nor his henchman Keymis, nor the politicians and courtiers who hung round the skirts of the affair and sought their pickings from it. In a cloud of false premises, false promises, mental reservations, and outright lies, the actors are drawn on until they face reality at last, sharp shot in place of phantom gold, prison and scaffold instead of the glittering empire which men such as they have never founded save in their daydreams. So the thing appears to those whose reaction to a character like Ralegh's is instinctively hostile. Very differently does it appear to others whose sympathies are naturally with him, as may be seen in many biographies.

Mr. Harlow, whilst not concealing his own estimate, affords fair play for either attitude. He has brought together all the available evidence, including much new matter discovered by himself, and he prints it in chronological sequence, preceded by his own interpretation or synthesis of the story. It is a method which is much to be recommended for a topic of this sort. The reader is enabled to check the historian's narrative by reference to the material from which it is composed; and if he is dissatisfied with the historian's interpretation, he has the means of criticizing it and evolving a version of his own.

Some of the problems which are faced and answered in this book are as follows: How did Ralegh mean to keep his promise, of opening the mine without fighting the Spaniards? He had two solutions: to take with him a force of French Protestants, who would deal with S. Thome whilst the English gathered the gold; or to excite a revolt among the Indian tribes, who would wipe out the Spanish colony without active aid from the English. Mr. Harlow shows conclusively that both these plans were entertained by Ralegh. They are a measure of the self-deception which poisoned the whole business. Would Frenchmen really have played cat to the English monkey? Would Ralegh have been held guiltless if Indians had killed Spaniards for him? Neither plan was tested, for the French contingent did not turn up, and the tribes did not rise. Ralegh's men themselves had to fight the Spaniards, and that fact made no difference to his subsequent fate. If he had brought home gold he would have been excused, and not bringing it he was condemned, and whether the English fought in person or by deputy was immaterial.

Where was the alleged mine, and where was the town of S. Thome? By close analysis and brilliant reasoning Mr. Harlow clears up these points, on which all others have gone astray. S. Thome had not been moved; it was where it had

stood for twenty years. Ralegh's statement to the contrary, after his return, was false. As for the mine, there were *two mines* (at least in Ralegh's imagination). One was near S. Thome, the other far down the river and a day's march from its southern bank. The evidence for belief in either was thin, but he believed in both. He never revealed that he was trusting in two mines, but he made statements that applied sometimes to one, sometimes to the other. Hence Bacon's sneer that the mine was movable. The lawyer penetrated the inconsistencies, but not their explanation.

Who believed that there was a gold mine? Ralegh believed, says Mr. Harlow, and the contention is reasonably proved. Keymis also believed. Well, he did in a way; but he was an enthusiast rather than a cool thinker. His belief was the facile optimism of one who shirks facts, and it evaporated at the first check on the scene of action. Did the Spaniards believe in it? Evidently not, for they had been settled for twenty years within 3 miles of this gold mine and had not found it. One must suppose that they had investigated. The English at home, King James, Secretary Winwood and the rest, must have supposed that the Spaniards had looked into the matter. It followed then that the mine had been found and secretly gutted, or that there was probably no mine at all. And yet the King adopted the scheme. He was no fool, and he stood to lose much by a fiasco. What was his reasoning? No one has ever answered the question. Men of harder heads than James I have their unguarded moments in which they fall victims to the plausible promoter; but James had looked at the thing for years before consenting.

Why did the King, desirous of alliance with Spain, allow the expedition, knowing that it must lead to hostilities in some form or other? Mr. Harlow's answer is, substantially, that James was not consistently pro-Spanish—he had his periods of irritation with the power which treated him so haughtily. He was willing to fight for a sufficient quantity of treasure. This has been said before, but Mr. Harlow advances a further and most interesting consideration, namely that the King could justify himself on the ground that the south bank of the Orinoco was English territory, having been annexed in 1595, and that the S. Thome Spaniards were trespassers. It would have been a good debating point, allowing a conference to save face for both sides by making a treaty instead of a war, and it forms a useful suggestion. But it runs counter to James's ascertained doctrine in other colonial disputes, which was that effective occupation overrode prescription. Effective occupation was certainly on the side of the Spaniards.

Finally, why did Ralegh remain at Trinidad, leaving it to Keymis to conduct the up-river expedition on which everything depended? Mr. Harlow gives the answer, that the captains refused to leave the coast unless they had Ralegh at the river mouth to defend them against being trapped by the arrival of a Spanish fleet. The decision sealed the fate of the venture, for, as Mr. Harlow shows, Keymis did not lead the raiding party as Ralegh meant it to be led. Ralegh, if the mine failed, would have called out the Indians and conquered Guiana, which, in view of the numbers and morale of the Spaniards, was a possible achievement. Keymis, having gathered one sample of mineral and found it valueless, became demoralized. His force, never disciplined, became a rabble. His officers expressed open disbelief in the gold. He retreated before Spaniards whom he greatly outnumbered, and never even looked at the second mine, downstream at Mount Iconuri. Ralegh would have shown more spirit and would have snatched at least a temporary success. But he was not there. He waited at Trinidad while Keymis ruined him. And that involves his reputation as a leader and a man of action. He never was master of his expedition. He could only yield to insubordination and pity himself for being so ill served.

Perhaps the most interesting items of new evidence here brought to light are the Spanish documents which reveal the state of affairs on the Orinoco and the ease with which it could have been conquered. The Spanish colonists were seditious and disaffected, ready to sacrifice their allegiance to the lure of trade with the English and Dutch. They were few in numbers, and afraid of the Indians. They were intriguing against their own governor at S. Thome, and, by one account, had agreed with the advancing English to betray the town to them. That is not substantiated, in Mr. Harlow's opinion, but it is at least clear that in the skirmish for possession of the town the unhappy governor was treacherously deserted by his men, who deliberately left him to be killed, and afterwards showed their hatred by refusing to bury his corpse. Such, apart from all finding of gold mines, was Ralegh's opportunity of empire-building.

Four years ago Mr. Harlow published his edition of 'The Discoverie of Guiana.' His introduction to that work comprised a fascinating essay on the character, attainments, and motives of Ralegh, and an account of the El Dorado project which presented English readers with fuller and more accurate information than had previously been available. The present volume describes the disaster of 1618 in equally clear-cut outline and detail. The author's masterly interpretation, no less than his skill and thoroughness in research, entitle these writings to rank as the most important works on Ralegh to appear in the past forty years. J. A. W.

SIR FRANCIS DRAKE. By LÉON LEMONNIER. (La grande légende de la mer. No. 20.) *Paris: "La Renaissance du Livre"* 1932. 7½×4½ *inches; 256 pages; illustrations. 15 fr*

This new biography of Sir Francis Drake forms the twentieth volume of the series entitled *La Grande Légende de la Mer*, to which many distinguished writers have contributed. M. Lemonnier himself is well known as a novelist, dramatist, and critic, and has already made several studies of Englishmen. His story of Drake is lively, vigorous, and readable, but it is also scholarly, and no important source of evidence has been neglected. It will serve as an important corrective, too, to the purely English biographies of Drake, for M. Lemonnier is familiar with the early maritime exploits of his own countrymen, the Huguenot adventurers and corsairs, which, because they were brought to an end by the assassination of Coligny, are generally overlooked. Drake learned much from his French predecessors and contemporaries, who had been harrying the Spaniards in the Caribbean for a generation. The relevant chapter entitled "L'exemple des corsairs français (1559–1570)" is based in part upon unpublished documents, and will usefully supplement the conclusions to be drawn from the series of Spanish documents on the same subject shortly to be published by the Hakluyt Society.

As a Frenchman, M. Lemonnier is fortunate in not being committed in advance to extolling Drake as a hero. He points out that it was chiefly in his earlier career, when he acted entirely on his own initiative, that he showed qualities of greatness: "sa vision devient plus trouble à mesure qu'il lui faut élargir son action." His comparison between the careers and characters of Drake and Raleigh (the latter has also formed the subject of a critical study by M. Lemonnier) is both arresting and acute. "Si l'intelligence et le sens critique étaient plus dévelloppés chez Raleigh, Drake montrait plus de jugement dans l'action. . . . Drake part pour conquérir les trésors de Panama: il sait exactement où ils se trouvent, il profite des reconnaissances françaises; il a des Cimarrons qui espionnent pour lui. Raleigh, le poète et l'homme de livres, est dupé par une légende poétique, celle d'Eldorado. Drake ne fût jamais parti sans avoir, sur le royaume de l'Inca, des

renseignements précis. Raleigh s'embarque à la légère, il se condamne à découvrir seul et avec beaucoup de peine le cours inférieur de l'Orénoque que les Espagnols connaissaient très bien, et où le premier renégat venu l'eût facilement guidé." And yet, when the aftermath of the two careers is examined, what is our judgment? Drake burnt cities, robbed ships, defeated Spaniards. His whole actions were destructive. Raleigh saw visions and dreamed dreams; it was from his abortive colony of Virginia that the Empire sprang. His whole actions were constructive. "L'un détruisit la force espagnole, l'autre construisit la force anglaise."

E. G. R. T.

GENERAL

EARLY ASTRONOMY AND COSMOLOGY: a reconstruction of the earliest cosmic system. By C. P. S. MENON. History of Science Library. [Vol. I.] Edited by A. WOLF. *London: George Allen and Unwin* 1932. 9×5½ *inches;* 192 *pages; illustrations.* 10*s*

When we speak, in Biblical phrase, of "the four corners of the earth," we are, according to Mr. Menon's persuasive hypothesis, using the terminology of the oldest concept of the cosmos, a system based on the square. The explanation of the rationalization of the universe in terms of the square rather than of the circle lies in the exigencies of primitive arithmetic. The division of a circle into equal parts presents great difficulty: not so the division of a square. By simply halving each side and joining the division points we have the four quarters. By halving each of the four quarters in a similar fashion, and rubbing out the central four divisions, we have a border of twelve squares, to which may be adjusted the twelve signs of the zodiac. By halving the divisions along the edge of the square yet again, and again rubbing out all but the bordering squares, twenty-eight divisions are obtained, to which the moon's cycle may be approximated. A repetition gives the number sixty, with its rich astronomical and "magic" associations, and so on. It was while watching a Hindu astrologer of to-day draw out his twelve "houses" in the dust that Mr. Menon first conceived of this new explanation of the genesis of significant numbers, and he proceeded to search the ancient writings of the Hindus, the Chinese, and the Babylonians for confirmation of his views. Such confirmation he appears to have found in abundance, but, as Professor Filon, who sponsors the work (originally a Master's thesis), observes, the author claims no finality for his views, but merely "to have set up a sign-post which may well point to the unification, or at least to the better co-ordination, of our knowledge of man's earliest attempts to form a coherent picture of the universe."

While the book is well written and very carefully documented, its subject-matter necessarily renders it very difficult for the layman to follow. Nevertheless it may be recommended not only to the expert, but to all who have felt the fascination of the Pythagorean doctrine of Number.

E. G. R. T.

EPISODES IN A VARIED LIFE. By LORD CONWAY OF ALLINGTON. *London: Country Life* 1932. 9×5½ *inches;* viii+276 *pages; illustrations.* 15*s*

The charm of this book is well displayed in Chapter XVII: "Life in the Mountains," which begins in Baltit and Nagar, whose Rajah's word was law, but he had to be careful what he said. The dancing-floor of Ariadne at Knossos has a parallel in every Himalaya village; but in Bolivia the threshing-floor is used for the great village festivals when they consume during three days and nights the chiche produced by three months' mastication by the women. The birth of imagination came by the village orgies of simple people, alcohol stimulating

soggy brains, and the impulse leading to the Homeric poems and the dramas of Aeschylus. But what the author was wanting to talk about was the Alps, and especially the Matterhorn. All praise to De Saussure and the scientific pioneers of Alpine sports. It was really the sport of climbing that captured Tyndall, but being a man of science he had to camouflage it. Whymper bores us when he employs diggers to display the structure of snowfields. The most excellent Mummery hated the sight of a plane table, and it was well that he and the author did not go to the Himalaya together, for Mummery wanted to conquer one great peak without bothering about geography, and Lord Conway wanted to explore the highest region of the greatest mountains in the world. Mummery was a philosopher attracted by problems of political economy, with long limbs and prehensile extremities, like a spider or a limpet on steep rocks; but a Himalayan avalanche swept him away on Nanga Parbat. And this brings us to Whymper and Mummery competing for the conquest of the Matterhorn, with four ridges. Whymper's conquest was made almost by a fluke and paid for by a terrible accident never forgotten and never fully explained (since Bishop Browne was the last repository of the secret and resolved it should die with him). Mummery eventually climbed the mountain by all four ridges, but it was left for two young Germans in 1931 to climb the northern face down which Lord Francis Douglas and three others fell on the first ascent in 1865. The Matterhorn would make a wonderful mountain god for the Indians of Bolivia, but only the ancient Chinese would fitly praise it. But Zermatt suggests Mark Twain, whose 'Tramp Abroad' misled a New Zealand legislator into opposing the introduction of the chamois: and that reminds Lord Conway that he first saw Bret Harte in Cambridge, and Li Hung Chang was there on the same day. Professor Palmer went to the station to meet them both. And so we come to an American, Clarence King, who was offered by Ruskin the choice of two Turner drawings, but remarked that one good Turner deserves another, and took them both. Speaking of Spitsbergen reminds Lord Conway that Nansen introduced ski to explorers, and thus he and Garwood shuffled about Spitsbergen on ski, and attacked a peak from opposite sides, but Conway partly fell through a snow bridge and remained stuck: "it was no good howling for Garwood."

This comprehensive account of Life in the Mountains is typical of a delightful book, that runs in no sort of order through the episodes of a varied life, as Professor of Fine Arts, mountaineer, collector, restorer of Allington Castle, Member of Parliament, President of the Alpine Club, and Director of the War Museum. His friends may congratulate him that he had been asked, almost ordered, to write some account of his life.

SIR EDGEWORTH DAVID'S GEOLOGICAL MAP OF AUSTRALIA

Messrs. Edward Arnold & Co. write to point out that the bibliographical details printed on p. 453 of the November *Journal* at the head of the review of Sir Edgeworth David's 'Geological Map of Australia' are in two respects misleading. Orders should be sent, not to Sydney, but to Messrs. Arnold; and the Map is also obtainable unmounted, together with the Explanatory Notes, at 20*s*. We are glad to correct an error which arose from the fact that the copy reviewed was a personal gift to the Editor from Sir Edgeworth David, not the English edition subsequently sent for review by Messrs. Arnold.—ED. *G.J.*

THE MONTHLY RECORD

THE DEATH OF MR. H. G. WATKINS

A Memorial Service for the late Mr. H. G. Watkins was held at Saint Michael's, Chester Square, at noon on Monday November 7. At the beginning of the Evening Meeting on that day, the first of the Session, the President said:

"I went this morning with many others of the Council, Fellows of the Society, and his friends, to the service held in memory of Gino Watkins. Even after that it is very difficult to realize that that brilliant young personality has left us. Much has been written of him, for one so young an extraordinary amount. His Majesty was so kind as to send to the Society a message of sympathy which many of you will have read, and you know that he has marked his appreciation of the work done by the British Arctic Air Route Expedition by granting them the Polar Medal, with the special 1930–31 clasp. How proud Gino Watkins would have been to have received that Medal at His Majesty's hands and, much more than that, how immensely gratified he would have been to see that the work of his companions was recognized as much as his own. The Danish Minister wrote to me: 'All Denmark mourns.' General Balbo, head of the Italian Air Service, telegraphed his personal feelings of loss, and there were very many other telegrams and letters.

"There must be many present who read the impression made upon one, his constant companion in Greenland, on the night of Watkins's death: 'It got dark and the stars came out one by one. Away in, towards the Ice Cap, some needle-shaped mountains of unbelievable steepness were silhouetted against an orange and crimson sunset. The Northern Lights at times almost obscured the brilliance of the stars. At first, vague patches of green light appeared. These gradually changed to clear-cut vertical ribbons of light all quivering and waving like seaweed fixed to a rock in a strong tide. Then these would disappear, and Arcturus, Vega, Taurus, Cygnus, Aquila, and the great Square of Pegasus would all shine just as if nothing had happened. Yet Gino was dead. We could not believe it.'

"I am told that to some that gave an impression of dejection of spirit, but that is not so. We who know those three young men who are left there—Rymill, Riley, and Chapman—know that there is no dejection of spirit left behind even by the loss of so great a leader. You may remember that when Robert Scott was two days off the South Pole he wrote: 'Great God, this is an awful place!' That was not a cry of despair: it was an expression drawn from a most sensitive mind by the immensity of his surroundings. And so with Chapman. Do not let anybody think for a moment that there was any dejection of spirit left behind when Gino Watkins had gone.

"No man seemed to have a fairer path to fame and happiness, not only in the activities which we profess in this Society but in other directions, so sacred that it is only just possible here to indicate them. Well, some hopes may be damped but not extinguished; some projects delayed but not abandoned. It would be an ill compliment to the youth of this country, of which Gino Watkins was such a brilliant example, to speak of extinction or abandonment. When those hopes are fulfilled, those projects completed, those who will have brought them to a successful conclusion will have been borne to their triumphs aided by the spirit of one whose loss we mourn most deeply but whose life has been a great encouragement and inspiration.

"A resolution of sympathy with Mr. Watkins's relatives was passed by the Council this afternoon, a resolution with which I am sure all the Fellows of the Society will wish to associate themselves."

It was Watkins's deliberate intention that his small party should lead an Eskimo life. In the last letter to the Society, printed in the October *Journal*, he wrote: "Since we have a large amount of scientific equipment we shall not have room in these boats for a house or much European food, so that we shall have to live for a year in a somewhat primitive way. We shall build an Eskimo house of earth and stone and heat it with blubber lamps. For our food we shall have to depend largely on hunting seals and polar bears." According to the plan, the party had on arrival built this Eskimo house, and were prepared to live in it. But they had in reserve a more comfortable possibility. Captain Mikkelsen was engaged this summer in erecting a chain of wooden houses which might serve as shelters for Eskimo parties moving up the coast: and he had promised Watkins that if he could he would come in to Lake Fjord and leave one of these houses, with a supply of coal, for his use. Captain Mikkelsen arrived early in September and had the house partly built by the time Chapman, Riley, and Rymill got back from Angmagssalik, after reporting the death of Watkins. His had been the duty of keeping the party fed, and without his skill as a hunter their position was embarrassed. It was therefore for them particularly good fortune that Captain Mikkelsen had been able to visit Lake Fjord: he gave them of his own private stores and sold to them, or rather took a receipt for, a quantity of Danish Government stores that were not his to give. By this timely assistance the position was restored, and the diminished party have an ample sufficiency of stores for the winter, and will be able to carry on their scientific work unhampered by the necessity of spending most of their time and energy in living off the land.

POLITICAL GEOGRAPHY OF SILESIA

We have received the first number of a new German serial, 'Zur Wirtschaftsgeographie des deutschen Ostens,' edited by Professor W. Geisler. This number is entitled 'Schlesien als Raumorganismus,' and is written by the editor. It opens with a statement of the German political theory of the state as an organism, composed of "cells" with definite functions to perform within the state, and linked by social, economic, and political bonds. Silesia is then stated to be such a cell within the structure of modern Germany, and the remainder of the pamphlet is an attack upon the territorial settlement in Upper Silesia. The sketch of the development of Silesia stresses its relations with the west—the Oder is the backbone, not the frontier, of the region. The frontier is formed by the forest belt farther east, and has, it is claimed, been stable since 1163. The early settlement of the open black-earth and loess areas, mainly to the west of the Oder, the clearing of the forest lands in the thirteenth century, the advance up the slopes of the Sudetes and into Upper Silesia, and modern economic developments are all pressed into service to illustrate this idea of a growing organism. The criticism of the territorial award follows the usual lines—language is not a fair test of nationality, frontiers should run through thinly populated areas, and so forth. It may fairly be said that one would scarcely gather that there were approximately 480,000 Poles to 707,000 Germans in the plebiscite area.

ZEMLEVEDENIE

The well-known Russian geographical magazine, *Zemlevedenie* ("Earth Knowledge"), now apparently published half-yearly, shows in the first issue for 1932, its thirty-fourth year, a very great improvement on recent numbers in type, paper, and illustrations. There are five articles of varied interest; unfortunately not one in this number has a summary in a western European language. A. Barkov describes very fully the Karst country in the great Samara bend of the

Volga (33 pages); M. Bogolepov writes on the continental character of the climate of Siberia (6 pages); L. Shaposhnikov and N. Vereshchagin discuss the possibility of acclimatizing the nutria (coypu) in Trans-Caucasia and Cis-Caucasia (39 pages); N. Strakhov considers the causes of the presence of hydrogen sulphide in the Black Sea (13 pages); and M. Bondarski contributes an interesting paper on the first Russian atlases (27 pages). The number concludes with the usual bibliography of recent publications (12 pages).

EXPLORATION IN NORTH KAMCHATKA

In *Zemlevedenie*, 1931, vol. xxxiii, 3–4, pp. 222–282 (with English summary, pp. 282–286), there is an account of the Penjina region of north Kamchatka by B. Bondarenko, geomorphologist of the expedition sent to explore it in the summer of 1930 by the Far Eastern Regional Scientific Research Institute. The Penjina river, which falls into the Penjina gulf at the extreme north-eastern corner of the Sea of Okhotsk, flows through the southern part of a great depression that runs for 700 kilometres right through to the gulf of Anadir flanked by extensions of the Stanovoi and Kamchatka ranges. At the head of the Penjina gulf a broad spur called the Kamenni Khrebet ("Stony Range") comes down from the Stanovoi on the north-west, closely approaching the lower reaches of the river. This is described as a flat-topped range of great age with smooth slopes "complicated by step-like terraces and cirque-like forms." It has a height averaging from 600 to 700 metres, but one peak overlooking on the north-east the Oklan, a right-bank tributary of the Penjina, reaches 970 metres. On the opposite (south) bank of the Penjina there is a stretch of tundra between the river and a narrow range parallel both to it and to the main Kamchatka chain. This narrow range, which is pierced by the left-bank tributaries Belaya and Talovka descending from an elevated plain, has hitherto borne the names of the Pontoneiski (eastern) and Talovski (western) Khrebet; it is now proposed to call the whole the Penjinski Khrebet. It reaches a height of 600 metres, and with its sharp peaks and "audacious young contours" presents a striking contrast to the Kamenni Khrebet. It runs down to the eastern shore of the gulf and may possibly be represented on the western shore by the mountains of the Elistratov peninsula, which is separated from the massif of the large Taigonos peninsula by a broad low isthmus. This system was apparently formed by folding in the tertiary period, the Penjina valley and gulf being due to a sinking between the ranges. Traces of ancient glaciation were found at sea-level and also in places remote from the sea. In the quaternary period the land sank and there was an invasion of the sea which partially washed away the morainic matter and left marine deposits of sand and pebbles. Finally the land rose again about 50 metres, and the region assumed its present configuration which is to a great extent preserved from the effects of erosion by the ever-frozen state of the soil. The rough sketch-map on the scale of 1/M (not 1 : 500,000 as stated) shows a mass of new topographical detail in the lower Penjina valley and round the upper half of the Penjina gulf. The Russian text deals at great length with the climatic conditions, gives an account of the mineral wealth, and discusses shortly the possibilities of colonization.

AIR SURVEY IN THE SUDAN

The Egyptian Government, through Mr. Geoffrey Parker, Inspector-General of Egyptian Irrigation Department, Khartoum, has presented to the Society forty-eight sheets of two surveys lately executed for them by the Air Survey Company, Ltd. The object of the survey was to study projects for saving that volume of Nile water which annually evaporates in the vast area of the Sudd.

The first survey covers an area of 15,000 square kilometres south of the Sudd, between the Nile and the Pibor, of dead flat plain of cotton soil, which is completely flooded in the wet season during the summer when tall grasses grow up and it takes the appearance of a vast swamp studied here and there with trees. In the late autumn, after the rains have ceased, this area dries up and the grass is burnt off, and towards spring the area is completely without water, even the pools having dried up. The Veveno river runs obliquely across the area to the Pibor in the east from swamps situated a few miles east of the Nile. The Veveno, dry in the dry season, becomes a formidable river in summer. The second survey covered 22,000 square kilometres, including the main portion of the Sudd region.

The scale of the maps is 1/50,000, the photographs being taken with a 7-inch lens on a scale about double that of the maps. Much of the area was extremely difficult to photograph owing to cloudy weather during the summer season, and smoke haze due to grass fires in winter combined with indistinct colouring; but all waterways and the drainage system were easily distinguishable.

Ground control was provided mainly by traverses, based on astronomical points. The traverses through elephant grass necessitated heavy clearing during the winter months, and all required a careful system of rationing field parties, especially with water in the dry season. Two Fairey III F machines were used. The field work was begun in January 1930 and completed in two seasons, and the last maps delivered in June 1932.

A LARGE GLACIAL ERRATIC IN OHIO

A very large glacial erratic is described by J. J. Wolford in the *American Journal of Science*, November 1932. It is in south-west Ohio, on a small tributary of the Little Miami river. Consisting of a large mass of Lower Silurian limestone, it appears to have an area of just over one acre, but has now, through quarrying and river erosion, been broken into three sections. Its thickness ranges from 5 to 17 feet, and its weight has been estimated at 13,500 tons. The position of this rock is 125 feet below the level of the division in this locality, but there are no signs of unusual erosion, or of the limestone having been downfaulted. Wherever the lower edge can be examined, the erratic is lying upon glacial till, which seems to have been deposited by the same ice-sheet that carried the rock thither. It has not been possible, owing to conflicting evidence of ice movement in this area, to determine the distance it has been borne, but the possibilities are between 4½ and 9 miles. In this journey it suffered very little deformation.

JOURNEY THROUGH ZAMORA

The state of Zamora, Venezuela, has declined relatively through lack of a developed system of communication: lying across the llanos and the south-eastern slopes of the Andes, it is practically isolated during the wet season. The results of a geographical reconnaissance through this area are published by Raymond E. Crist in the *Geographical Review* for July 1932, with a sketch-map of the border region between these two great physiographic regions. The flat llanos, inundated from May to July, give place to the foothills, where the water is more rapidly absorbed by the deposits of sand and gravel, in which small streams disappear on reaching the plains. Conditions of topography and ground water determine whether the plains are grass or woodland. The banks of the streams which flow south-eastwards to the Apure are lined by gallery forests, and these are striving to spread over the grasslands. A great triangular forest—the Selva de Ticoporo—the interior of which is said to be unexplored, seems to owe its existence to the union of the gallery forests of the tributaries of the Suripa.

The boundary between plain and mountain is the south-eastern scarp of the Front Ranges, of gravel composition, 300–400 metres high. Around Barinas, the State capital, there is a remarkable terrace formation, the result of a recent uplift. These sedimentary mountains have undergone much deformation in Tertiary times. The Santo Domingo river, occupying a fault-line, provides a low pass to the Merida region. This, with the terraces for town sites, and the proximity of the llanos, has favoured settlement in this portion of the ranges. The grasslands are naturally adapted to grazing, and a good breed of cattle is raised, though a small part only has been developed. Forest products are plentiful, and some clearing has been done to grow corn for fattening hogs. Formerly, cacao and tobacco from this region were highly esteemed. Its development however depends upon the improvement of communications. The motor road from Acarigua to Pedraza (Ciudad Bolivia) is practicable for five months in the year only and, apart from mule trains across to the Transandine highway, the only other contact is made by canoes down the tributaries of the Apure. However a road, the Carretera Occidental, is being built, following the physiographical boundary, from Acarigua to San Cristobal, Tachira.

THE SOUTH MAGNETIC POLE

We have received from Captain T. J. J. See, Professor of Mathematics, United States Navy, a "Press Report, released to the morning papers of 13 October 1932," stating that the 440th anniversary of Columbus's Discovery of America, 12 October 1492, had been chosen for announcing . . . that the Magnetic Poles of the Earth are in conical circulation about the Gaussian Axis of Maximum Magnetic Moment in North-West Greenland, in a Period of 540 years.

Section 8 of this statement reads:

> "It is a curious and somewhat distressing fact that in 1841 Sir James Ross found the ice barriers in Antarctica so great that he could not get very close to the Southern Magnetic Pole. It was afterwards searched for by Shackleton's party, 1909, Scott, 1912, Mawson, 1912, yet in spite of the most heroic efforts, none of these explorers came very near the Magnetic Pole, because they searched close to Ross's position of 1841, whereas it was over a thousand miles away, nearly on the opposite side, toward Madagascar and the Cape of Good Hope, and not South of New Zealand, as had been assumed.
>
> " This new position is definitely proved by the Theory of the Precession of the Poles now established, and by the Carnegie observations recently made at the Cape of Good Hope, showing that of the late years the Magnetic Pole is moving towards the point of Africa, so that there the 'horizontal component of the Earth's Magnetism is decreasing at a phenomenal rate.' Future explorers in the South should take account of this error of past traditions, and direct their efforts to the real place of the Pole, now very different from Ross's approximate position of 1841."

In a covering letter Professor See says:

> "The Magnetic Pole in the Antarctic is not where Shackleton and Mawson searched, but at least 1000 miles, perhaps 1200 or 1400 miles, farther towards the African quadrant, in South Latitude 77°, East Longitude 52°.
>
> "This more accurate location of the Magnetic Pole should be borne in mind by future explorers: and thus I call it to the attention of the Royal Geographical Society."

Without, perhaps, wishing to enter into the merits of the theory, geographers who may have seen this statement published in the newspapers will like to be reassured of the facts. The Admiralty Chart 'Curves of equal Magnetic Varia-

tion 1932,' published on August 5 last, compiled at the Royal Observatory, Greenwich, and explicitly including the results of the surveys carried out by the Carnegie Institution of Washington, gives the following positions for the two Magnetic Poles:

North Magnetic Pole about	72° N. 97° W. or 263° E.
South Magnetic Pole about	73° S. 156° E.
which is far from Professor See's	77° S. 52° E.

There could be no doubt that the Admiralty Chart was essentially right and Professor See wrong. But it seemed interesting to inquire just how certain the position of the South Magnetic Pole may be. We have therefore consulted Professor Sydney Chapman, F.R.S., who kindly replies: "You may if you wish state in the *Geographical Journal* that you have asked my opinion as to the reliability of the generally accepted position of the South Magnetic Pole, which is based on several independent and closely accordant determinations by different expeditions. In my opinion the position is well determined, and any suggestion that the Magnetic Pole is 1200 miles away is in flat contradiction to the facts of observation."

PROGRESS OF THE ORDNANCE SURVEY, 1931–32

The year under review in this Report was marked by the publication of the first sheet (Plymouth) of the new Fifth Relief Edition of the 1-inch map, and also the Special District Map of Aldershot North. These sheets have already been discussed in the *Journal* (vol. 78, p. 353, and vol. 80, p. 358). From this Report of Progress it appears that another sheet in this edition has been completed for reproduction, and four further sheets and Aldershot South are nearing completion. Eight sheets are in process of compilation and drawing. Two special 1-inch District Maps of the Chilterns and the Norfolk Broads have been published. It is interesting to note that the number of sheets sold was greater than in any previous year: this was largely due to the popularity of the 1-inch maps, for there was a falling-off in the sale of 25-inch plans. A considerable amount of time was given to work for the Land Valuation scheme and for the review of county administrative boundaries.

A Gravity Survey was carried out in the west of Scotland with the pendulum apparatus lent by the School of Geodesy, Cambridge. The result was to treble the number of precise gravity stations in Great Britain, which is now thirty. Greater gravitational anomalies than any in Southern England were recorded. The stations along the west coast gave small, those in the Outer Hebrides somewhat larger, positive anomalies.

In the section on archaeology it is noted that the collection of air-photographs, now numbering nine thousand, is in constant use. Detailed study is to be made of air-photographs of Salisbury Plain, to determine the plan and purpose of the prehistoric fields and earthworks. For the series of historical maps, which already includes Roman Britain and Stuart England, two more are being compiled—Early Scotland and Anglo-Saxon England. A catalogue of the four hundred photographs of old cadastral plans has been printed.

EXHIBITION OF OLD MAPS AND PLANS

An interesting and instructive exhibition of old maps and plans was held at the house of the Surveyors' Institution in Great George Street in late October and early November. Apart from a certain number, not the least in interest, owned by the Institution itself, the exhibits had been lent for the purpose by various bodies and private owners, and its collection and arrangement must have involved much hard work, on the results of which those who undertook it

are to be warmly congratulated. The exhibition was strongest on the side of detailed surveys, *e.g.* of private estates, thus covering too small units to concern the geographer as such. But a great deal was shown that threw valuable light on the economic development of Great Britain, especially during the nineteenth century. Such were the original deposited plans of the earliest railways, lent by the great railway companies, and the city plans illustrating the development of such units when first affected by the modern growth of population. A useful feature was the frequent exhibition, side by side with the old plan, of a modern one in which the area covered by the development schemes was marked off in outline. Thus one of the exhibits of the Ordnance Survey showed Chelsea (1) as surveyed in 1664, (2) as parcelled out for building about 1779, and (3) as it now is. A good many estate plans were lent by colleges in Oxford and Cambridge, and these included some fine examples of colour work on parchment, particularly striking being a large MS. volume showing all the lands owned by Queen's College, Cambridge, about 1843. A few of the plans were as early as the seventeenth century, though none of the quite early work of John Norden in this line seems to have been represented. Two interesting MS. items were: a chart of the Thames, illustrating Queen Elizabeth's tour in 1584 to review the troops at Tilbury; and a map of unknown date showing the King's private road from Fulham to Pimlico.

On the more strictly geographical side some interesting rarities were shown, such as a coloured example of the "Christian Knight Map," by Hondius, exhibited by Messrs. Myers & Co. The note in the catalogue disclaiming its character as an original issue appears to have been due to a misapprehension. The same firm showed copies of three exceedingly rare maps, engraved in Holland, illustrating Drake's West Indian voyage in 1585–6. Several scarce early county maps were shown, but mostly in fairly late reissues. The exhibits by the Institution itself included volumes of the great atlases of Blaeu, Moses Pitt, and others, and in particular a fine collection of plans, views, and a few maps by John Rocque, bound with his great plan of London, as reissued after his survey in 1751. The provincial plans to be credited to him include those of Bristol and York, and he also brought out one of Paris on the same scale as his smaller plan of London for the purpose of comparison. As mentioned by Sir George Fordham (*Journal*, vol. 70, p. 51), Rocque was responsible for a reissue (1752) of the "Quartermaster's Map" of England, 1644, and this is included in the volume. There are also plans of Continental towns published by Edward Ockley and others. Modern survey work was represented by specimens of recent air photography.

The catalogue of the exhibition is well supplied with explanatory notes, and as it records also the present owners of the items, it will be useful for reference in the future.

THE EARLIEST EUROPEAN VISITS TO SIWA

In reference to the note in the October number, p. 366, on the travels of Alessandro Ricci in Egypt early in the nineteenth century, Mr. Said-Ruete writes to point out that the statement there made that Ricci was the first traveller who had been permitted to enter the city may be questioned. It was perhaps not made clear enough in the note that it was the city, not the oasis of Siwa that was referred to, for both Browne and Hornemann had previously reached the oasis and examined some of its antiquities. The late Mr. Silva White, in his book on Siwa, says that these early travellers had not penetrated into the "inner city," and the Italian writer quoted in our note says that they had not been allowed to enter "nell' interno della città proibita." But Mr. Said-Ruete maintains that

Hornemann at least must have entered the city in 1798, as he gives a short description of it and speaks of its dark and intricate streets. He says also that he attended several of the general councils of the authorities, held close to the town-wall, but whether within or without is not very clear. Hornemann's camp seems anyhow to have been outside. Browne, whose visit preceded Hornemann's by six years, speaks of coming to the town, but is not explicit as to whether he actually entered it. Another traveller who reached the oasis before the Egyptian Expedition which Ricci accompanied was the French officer Boutin, whose visit is mentioned by Burckhardt ('Syria and the Holy Land,' 1822, p. 573) and Buckingham ('Travels among the Arab Tribes,' 1825, p. 429). But according to the former he was only three days in the oasis and apparently made no discoveries. The well-known travellers Caillaud and Minutoli were in the oasis shortly after Ricci.

ANDEAN VALLEYS OF PERU

While flying in Peru in 1929, Lieut. G. R. Johnson photographed the Colca valley in the Andes north of Arequipa, which contained several villages, the existence of which had almost been forgotten in recent years, though they appeared upon Raimondi's map of fifty years ago. To study the present condition and life of this valley he organized an expedition in 1931, in co-operation with Mr. Robert Shippee, and aided by the American Geographical Society. Mr. Shippee gives a brief account of its work, illustrated by excellent photographs and a mosaic map from air-photographs, in the *Geographical Review* for October 1932. When further inquiries were made, it appeared that the Colca valley was not entirely overlooked by the political administration, though only one village, Chivay, had somewhat intermittent communication with Arequipa and with Cailloma, the provincial capital. The conspicuous features of the villages from the air are the rectangular plan common to Spanish America, the disproportionately large church, and the cultivated terraces around. Many of these villages are now in ruins; forced labour in the mines, famine and plague having reduced the population, which is still purely Indian. Historical records show that the Indians were established in these new villages by the Spaniards about 1570, and this is supported by the statues of Philip II found in many of the churches. Mr. Shippee ascertained that a considerable export of wool is made to Arequipa by llamas: of the annual export of approximately 80,000 lb., three-quarters is pure alpaca.

After working down the Colca valley, the party climbed up the steep valley side at Llanca, and reached the Andagua valley. Here an aerial survey revealed at least forty previously unsuspected volcanic cones. The valley floor is also covered by lava flows up to 50 feet in depth. Like the volcanoes, these flows are of various ages, and appear to have been responsible to some extent for the decrease in population, as they have invaded terraced slopes. The photographs of the volcanic cones and village sites are particularly striking.

OBITUARY

ALBERT PERRY BRIGHAM

We record with deep regret the loss of Albert Perry Brigham, an Honorary Member of the R.G.S., who died on 31 March 1932 at Washington, U.S.A., in his seventy-seventh year. Professor Brigham was one of the best-known American geographers. He had been associated with Colgate University, Hamilton, N.Y., for nearly forty years as student and teacher; and as a geologist he made his mark by his studies of the glacial features of Central New York. Quite early in his teaching career he turned to geography, his 'Introduction to Physical Geography' was published in 1902, and from that time his interest seems to have been evenly divided between geology and geography.

Apart from his writings he became known in this country by his visits, in the first place to the Oxford Summer School of Geography in 1908 and 1914, and again in 1922, 1924, and 1930. On his last visit he was a delegate to our Society's Centenary Celebration. He was also well known to many of the British geographers who visited the United States, as an active member and officer of the Association of American Geographers, and in recent years in his last post as Consultant in Geography to the Library of Congress. In this post he did much to improve an already great collection of maps and geographical literature and to aid those students who came to use it.

Brigham was an unusually inspiring teacher with a clarity of exposition, in lecturing or in writing, which made him one of the most successful popularizers of geography in the United States, where his school texts have had a very wide circulation. He was also a keen and conscientious observer and recorder of facts; and all his work was based on the firm foundation of a thorough first-hand knowledge of the countryside in which he lived and worked so long; he was an open-air geographer. His strong personality, graced by an old-world courtesy and an unfailing kindliness, gained for him a host of friends and made him an impressive figure in any gathering. C. B. F.

SIR EVERARD IM THURN

The death of Sir Everard im Thurn at the age of eighty, which occurred at his home, Cockenzie House, Prestonpans, on 8 October 1932, has deprived the Society of one of its older members. He was elected a Fellow in 1885, served on the Council from 1911 to 1917, and was a Vice-President from 1914 to 1917. He was an enthusiastic naturalist specially interested in botany and anthropology, and an explorer of considerable merit. He served under the Colonial Office for many years, ending his active career as High Commissioner of the Western Pacific.

The third son of Mr. John Conrad im Thurn, a well-known merchant banker in the City, Everard im Thurn was born in 1852 and educated at Marlborough and at Exeter College, Oxford, where he graduated in 1875; he was elected an Honorary Fellow of his College fifty years later. In 1877 he went to British Guiana as Curator of the Georgetown Museum. In 1882 he was appointed special magistrate of the Pomeroon River District where his work lay almost entirely among the Indian tribes of Guiana with whom he had close bonds of sympathy. He made many studies of their customs and institutions and published a number of papers relating to these interesting and unspoilt children of nature. In 1890 he was appointed Government Agent in the north-western district of the colony, and it was during this period that the boundary dispute with Venezuela took place; im Thurn's intimate knowledge of that portion of the world was of much service to the Commission appointed to settle the quarrel.

After a short time as principal clerk in the Colonial Office in London he was appointed in 1901 Colonial Secretary and Lieutenant-Governor of Ceylon, and in 1904 Governor of Fiji, High Commissioner of the Western Pacific, and Consul-General for the Western Pacific Islands. He retired in 1910 and settled first in London and after the war at Prestonpans near Edinburgh.

It was during his time in British Guiana that im Thurn was most active as an explorer and writer. He visited the Kaieteur Falls of the Potaro River twice in 1878 and 1879. These magnificent falls had been discovered in 1870 by Mr. Barrington Brown, and im Thurn was the second white man to visit them. In 1884–5 he made a journey in company with Mr. H. L. Perkins to the famous table-mountain of Roraima which is surrounded on all sides by perpendicular cliffs and had baffled all previous visitors who had tried to ascend it. By a diagonal ledge on the south face im Thurn and his companion succeeded in reaching the plateau and in making collections and observations which were embodied in a paper read before the Royal Geographical Society in 1885. He also read other papers before the Society on "A Journey to the Interior of British Guiana," in 1880; "The Northwestern Districts of British Guiana," in 1892; and in 1915 on "European Influences in the Pacific, 1513–1914."

While in British Guiana Sir Everard founded a scientific journal, *Timehri*, which he edited for five years and which contains much valuable scientific and economic information about the Colony; he was also the author of 'Among the Indians of Guiana,' published in 1883, and of many papers on the geography, natural history, and anthropology of British Guiana, Ceylon, and the Pacific. Sir Everard was President of the Royal Anthropological Institute in 1919–1920. He was also a very old Member of the Hakluyt Society, and served on its Council for many years. He edited, with Mr. L. C. Wharton, for that Society 'The Journal of William Lockerby, Sandalwood Trader in the Fijian Islands 1808–9,' which was issued in 1925.

Many honours were conferred on him. He was created C.M.G. in 1892 and K.C.M.G. in 1905, C.B. in 1900, and K.B.E. in 1918. He was an honorary LL.D. of Edinburgh University, and was elected to the Athenaeum in 1909. He married, in 1895, Hannah, daughter of the late Professor Lorimer, of Edinburgh University, who survives him. A man of great modesty and retiring habits, im Thurn never perhaps attained to the fame to which his learning and achievements entitled him. His work among the Indians of Guiana and the natives of Fiji is his best monument to fame. W. L. S.

ALFRED HERBERT JOY

The untimely death of the late Inspector A. H. Joy, of the Royal Canadian Mounted Police, removed one of the most capable and distinguished officers and administrators of that famous force as well as one of the most energetic and resourceful Arctic travellers and explorers of the present time.

Alfred Herbert Joy was born in Bedfordshire on 26 June 1887, the son of Philip Joy, and died suddenly at Ottawa on 29 April 1932. His early education was obtained in Bedford Grammar School, after which he went to Canada and, after a short period of ranching on the Western Prairies, enlisted in the old Royal North-West Mounted Police on 19 June 1909, serving continuously until the day of his death. Three years after joining the force he was made corporal, in 1916 sergeant, and in 1921 staff sergeant; on 15 September 1927 he was commissioned inspector. In the annual blue books, Reports of the Royal Canadian Mounted Police, the terse records of his part in the arduous frontier work of this famous organization may be found.

After valuable experience on various subarctic patrols in the Mackenzie and Liard river regions he accompanied Inspector J. W. Phillips, in 1920, on a patrol by canoe, sailing boat, and motor launch to Belcher Islands, in Hudson Bay, investigating a complicated murder case among the primitive Eskimos of that region. In 1921 the Canadian Government decided to extend its jurisdiction in the Canadian Arctic Archipelago, and Joy was selected to represent the Canadian Government on Baffin Island, establishing a post at Ponds Inlet, for which purpose he was commissioned justice of the peace, coroner, special customs officer, and postmaster; at the time this was the most northern post office in North America. During the following year Joy travelled over much of northern Baffin Island, and in 1924 made a 650-mile patrol from Ponds Inlet to Lancaster Sound and Prince Regent Inlet to test the practicability of communicating with the Ellesmere Island detachment.

On 25 August 1925 Joy took over Craig Harbour detachment on southern Ellesmere Island, with two constables and two Eskimo families from Greenland. The most important event was his patrol to Grethasoer Bay fjord and Axel Heiberg Island by way of Jones Sound and the west coast of Ellesmere Island, travelling 975 miles with sledges in the forty days between 22 April and 31 May 1926, much of the journey lying through a region which is little known. Just previous to this long patrol he made a trip with Constable Dersch and one Eskimo from Craig Harbour across Jones Sound and over the interior of Devon Island to Dundas Harbour and back again. This resulted in the discovery of a practicable route over the centre of glacier-covered Devon Island. During the winter of 1926–1927 Joy, being in charge of the most northerly post (nearly 80° N. latitude) at Bache Peninsula, Ellesmere Island, travelled 2115 miles on exploratory patrols, the most remarkable being a journey of over 1300 miles with Constable Garnett and two Eskimos across Ellesmere Island and to Axel Heiberg, Sverdrup, King Christian, Cornwall, and Graham islands, from 26 March to 18 May 1927. After a year's interval Joy returned in 1928 in charge of the Eastern Arctic sub-district, with headquarters at Dundas, Devon Island. A base of provisions was laid down by the ship on Beechey Island in 1928 and on 12 March 1929 Joy made a patrol from Dundas to Winter Harbour, Melville Island, and thence to Bache Peninsula, Ellesmere Island, by way of Lancaster Sound, Beechey Island, Bridport Inlet, Hecla, and Griper Bay; touching at Edmund Walker, Lougheed, King Christian, Ellef Ringnes, Cornwall, and Axel Heiberg islands, he reached Bache on May 31 after eighty-one days, covering well over 1700 miles. Only one who has seen the Eastern Canadian Arctic, with its precipitous rocky shores, high tides, and moving ice-floes can appreciate the magnitude of his work, of which the published annual reports of the Royal Canadian Mounted Police give the bare details. During 1930 and 1931 Inspector Joy remained in command of the Eastern Arctic sub-district and made the annual patrols of inspection of the Arctic posts on the S.S. *Beothic*. Since 1914 Inspector Joy spent no summer in civilization, but during the winter of 1931–1932 he was in Ottawa and Montreal, preparing for another tour of duty in the Arctic.

Joy was a big man of splendid physique combined with a quiet self-contained manner and a faculty of making friends and commanding the whole-hearted respect of all ranks. His patrols were primarily made in the interests of justice, establishing law and order among native tribes, and upholding the jurisdiction of the Canadian Government in places far beyond the ordinary routes of travel. While making patrols for such purposes, and in searching out practicable routes for connecting the widely spread detachments of the Royal Canadian Mounted Police, he made many discoveries, corrected errors in old maps, and made important additions to geographical knowledge. Having a keen and intelligent

interest in scientific problems connected with the Arctic, he made important collections relating to Eskimo ethnology and archaeology, and brought back valuable zoological material for the National Museum of Canada.

Joy's skill and knowledge of Arctic work were recognized outside his own country, and Admiral Byrd invited him to take charge of part of his last Antarctic expedition, but Joy's heart was in the Canadian North, where his country had more important work for him. As his commanding officer, Major-General J. H. MacBrien, Commissioner of the Royal Canadian Mounted Police, said of him after his death: "He was a most efficient officer, and was considered as the country's leading expert on matters affecting the lands near the Arctic Circle."

R. M. A.

CAPTAIN P. M. H. LEMON, Royal Signals

Percy Lemon died at the age of thirty-four. He lived a varied life and he made the most of it because he had the gift of doing things thoroughly.

In October 1914 he was interned in Germany. He was released on parole and so was prevented from fighting in the Great War; but in spite of this handicap he decided to join the Army. He was with the Royal Corps Signals in Woolwich and in Egypt in 1922. In 1928 he went up to Cambridge to take the Engineering Tripos, and there he met Gino Watkins and became associated with the British Arctic Air Route Expedition. His achievement in Greenland was surely the apex of his life.

An exploring party is by its very nature a social unit which has been cut down to a minimum: to increase the number of individuals would be unpractical and to reduce it must detract from the efficiency of the whole. In Greenland we realized this and were particularly conscious of the important part which Lemon played. We depended on him for our communication with home and for his technical skill in a hundred mechanical problems. It is not surprising that he was an essential part of the work of the expedition, but we were still more conscious of his contribution to its social life. When he died one felt that a second gap had been torn in a small circle of friends held together by something which could be shared by no one else in the world.

One looked back to Greenland and relived some incidents which were no less important because they are hard to tell in print. Returning through the rain to the new base hut which three weeks before had been a bare and cheerless barn, we found instead a warm home, lighted with electricity, an efficient staff of Eskimos, and Lemon, the *maître d'hôtel* who had done all this alone, calling for food in a strange language and handing round glasses of hot punch. In time we all learned to speak Eskimo more or less, but it was Lemon who had discovered that first most difficult phrase, "what is your word for this?"

One remembered an untrained sledge party camped in an exposed place on the bare ice of the lower glacier slopes. During the night a sudden gale blew away the tent in which Lemon and his companion were lying. They watched it vanish in the darkness over the icefall below them and then crawled on hands and knees to the other tents to shout through the din of wind and cracking canvas that bed and breakfast was required for two. He was quick to learn the arduous technique of sledging for a man who, as he said, had committed his last athletic act in 1914. One remembered the cynical humour which followed his annoyance with exasperating dogs and his definition of pemmican, that it kept the body twitching but not the soul.

The autumn gales blew down his wireless masts; he put them up again reduced in height but still efficient. The Eskimos hung their washing on his counterpoise and dogs wandered into the room while he was transmitting; he

cursed them cheerfully and sent his messages. In the spring he started, nervous as we all were, for a first kayaking lesson, and returned to tell as a great joke that he had turned upside down and had hung there holding his breath and speculating on the right method of procedure until Neckodemudgy paddled out and pulled him right way up. After that he practised constantly to prepare himself for the summer coast journey to Julianehaab; one remembered that that journey was successful and looked at the map which Lemon made in such difficult circumstances.

When he lay sick in England and uncomplaining throughout a year of almost continual suffering, he talked without envy of those who could still do active things. J. M. S.

ARTHUR SILVA WHITE, F.R.S.E.

We record with much regret the death, early in October, of Mr. A. Silva White, better known, no doubt, to an earlier generation of geographers than to those now active, for, though only seventy-three at his death, he had latterly lived in retirement at Ixworth, in Suffolk, a victim of chronic asthma. In the new impetus given to geography in the last decades of the past century he played no mean part, being an active worker for the Scottish Geographical Society in its early days, both as its first secretary and as editor of its magazine (1884–1892). He was a fairly prolific writer both of books and magazine articles, and his fresh and somewhat unconventional way of treating subjects made his writings always worth reading.

Silva White was early attracted to the question of African development, the subject of his first book, published in 1890, and in a second edition only two years later. A keen imperialist, he edited in 1892 a volume on 'Britannic Confederation,' to which a number of well-known writers, including Professor A. E. Freeman, contributed. In 1895 he was joint author of a well-written Life of Sir Samuel Baker. His never robust health caused him to spend considerable intervals abroad, and while in Egypt in 1898 he fell under the spell of the desert, braving the discomforts of an expedition to Siwa, then less accessible than now to the ordinary traveller, of which he gave an excellent account in a book published in 1899. In the same year he brought out also a work on 'The Expansion of Egypt.'

He had a special gift for organization, which stood him in good stead not only as Secretary of the Scottish Geographical Society, but later as Assistant Secretary (as the permanent secretary was then called) of the British Association (1904–09). During and after the war he did good work in the War Trade Intelligence Department, and in the Reconstruction Branch of the Civil Service Commission. He was twice married, and had one son and one daughter. He was a genial companion and his friends could only regret his disappearance from among them owing to his delicate health. E. H.

MEETINGS: SESSION 1932–1933

First Evening Meeting, 7 November 1932. The President in the Chair

Paper: The Mountains of Northern Labrador. By Mr. N. E. Odell

First Afternoon Meeting, 14 November 1932. The President in the Chair

Papers: Early Maps of Great Britain: The Matthew Paris Maps, by Miss J. B. Mitchell; the Gough Map, by Mr. R. A. Pelham; the Tschudi Map, by Mr. E. Heawood